THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED

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VALUE OF CIRE PERDUE AND WISSAHICKON BRIDGE STANDARDS.

By John G. Niederer.

The value of Cire Perdue castings are becoming more known and acknowledged as more of this product is brought forward and more concerns are familiarizing themselves with its peculiarities as regards its possibilities and limitations when viewed from a point of ornamental features and cost of producing. There is no doubt that were architects generally conversant with all its points of merit there would be more call for this class of work in their specifications.

A recent product in this class are the standards embellishing the really wonderful concrete bridge crossing the Wissahickon Creek, Philadelphia, Pa., at one of the most scenic spots along this beautiful and historic stream, one marvels at the boldness of the engineers who placed here a concrete bridge of span vastly beyond anything in this line then in existence anywhere in the world, and it seems fitting that worthy and carefully studied embellishments only should grace this splendid structure.

BRONZE STANDARDS CAST BY CIRE PERDUE PROCESS. ERECTED ON THE WISSAHICKON BRIDGE, PHILADELPHIA, PA.

To Architect William E. Groben was assigned the task of designing and supervising the construction of these standards. The photograph, here reproduced,

shows how successfully this task has been consummated and as one report says: "the design shows appreciation of mass and scale as well as delicate refinement of the ornament and detail and the work merits much consideration for the skillful manner in which it was executed." The advantages of making these standards by the Cire Perdue process are that the usual clamping, screwing and bolting together of various details such as leaves, medallions, etc., are uncalled for and therefore the tendencies of weather changes as well as the efforts of vandals to tear apart and destroy are reduced to a minimum. The base for instance, including the four sides with medallions, is cast in one piece, the leaf ornament above base in one piece, the leaf cup with turned over leaves is cast in one piece, the shaft with lower leaf ornamentation and four medallions all cast in one, the arms are each cast in one piece and inserted in sockets of octagon piece of column or shaft.

As regards retaining the sculptor's expression in the ornamentation it will be found upon investigation that the undercutting of the leaves, the undercutting of the egg and dart and the undercutting in the flutes of column, which flute is a cove showing a section of circle whose center is below periphery of column diameter, have been most carefully retained. It would have been impossible to have shown all these undercuttings if castings had been made in sand and in one piece, which effort, I believe would not have been attempted by any sand molder had they received contract to construct.

Great credit is also due the scluptor, Hans Hummer of Philadelphia for his work in so thoroughly expressing the architect's design with crisp strength and yet that softness of finials, so characteristic of the Renaissance. Philadelphia has cause to be proud of its bronze standards as well as its wonderful bridge, for they too emphasize a step forward in the line of bronze outdoor constructions in this country.

Whatever temperature changes may come, there are no seams to open in Cire Perdue products. How many really beautiful sand cast pieces are made unsightly by gaping seams or by the loss of some details either broken away by extreme temperature expansion or stolen by some vandal. Cire Perdue methods have a message, watch them grow.

TINNING ARTICLES OF GRAY IRON, MALLEABLE IRON AND STEEL

By Charles H. Proctor.

In less than a decade electro-galvanizing has made a wonderful advance and is being used upon many articles that were formerly coated with tin especially upon articles that are exposed to a continual atmospheric influence. The zinc coating prevents the formation of oxides so that articles that are made of iron or steel when lightly coated will not rust as long as the iron is not exposed. Even then the zinc exerts its galvanic action and protects the iron as long as any zinc remains. For culinary articles and many other articles of household use galvanizing will never replace tin. Tin is a more attractive metal and is not poisonous as is the case with zinc, and therefore tin will never be displaced by zinc. While attempts have been made to do so, electro-tinning will never replace molten or dip tinning in the same manner as galvanizing unless a solution is produced that will give equally as good results as the electro-galvanizing method. In summing up the process of the hot tinning it consists of the following operations:

First: Cleansing the articles from sand or scale by pickling in hydrofluoric acid, ranging in strength from 5 to 10 degs. Baume.

Second: After removing the scale the articles should be tumbled, if possible, to brighten the surface. This may be accomplished in an ordinary tumbling barrel, using sal soda and water as the tumbling medium. The tumbling should be continued for thirty minutes to an hour.

Third: Removing from the tumbling barrel, washing in cold water, immersing in a five to ten per cent. solution of muriatic acid to remove oxidization. Then immerse in the flux, consisting of muriate of zinc in the concentrated form. To each gallon of the acid four to five pounds of sal ammoniac is added.

Fourth: After immersion in the flux the articles are drained well and immersed in the molten tin pot. The articles are kept in the tin bath until they receive sufficient heat and become thoroughly coated with tin. They should then be removed and the excess of tin rapidly thrown off by a quick motion. This is the first coating. The temperature of the bath should be 500 degs.

Fifth: From the first tinning the articles should be quickly immersed in the second bath or finishing bath. This bath is maintained at a temperature of 400 degs. The surface should be covered with pure beef tallow mixed in the proportion of five pounds tallow and one pound of palm oil. This should be maintained at a depth of from one-half to two inches. This oil coating acts as a flux and makes the tin run free, prevents oxidization and gives a more uniform coating. The excess of tin is removed by quick slinging motions, and then immersed directly in kerosene oil. The kerosene oil bath should be surrounded by running cold water, if possible, to keep down the temperature of the oil and prevent ignition.

Sixth: The articles are now plunged in clean, boiling water to remove the kerosene oil as much as possible and then dried out with a cheap wheat flour or fine maple sawdust. This completes the tinning operation, although on a high class of work sometimes three or four tinning kettles are used, each kettle maintained at a lower temperature, when a heavier coat of tin is required. Muriate of zinc is prepared by dissolving all the scrap zinc that muriatic acid will absorb. These additions should be made continually for ten hours, avoiding an excess at one time owing to the rapid generation of hydrogen gas.

Straits or Banca tin should be used for good results. Some concerns cheapen the cost by adding from twenty-five to fifty per cent. lead. The hydrofluoric acid should be contained in wooden or lead lined tanks as this acid acts upon anything of a vitreous nature. A mixture of chloride of zinc and sal ammoniac should be added to the tinning bath to remove the dross and keep the tin fluid. This should be skimmed off and saved as a residue and when sufficient has been accumulated it should be remelted for the tin it contains. Small articles should be wired up, using soft iron wire or baskets made from iron wire mesh. When small, articles are tumbled dry, to polish their surface. A second tumbling should be given in an air tight barrel, arranged with pressure valves. The tumbling medium should be five per cent. muriatic solution with the addition of two pounds sal ammoniac to every ten gallons of the acid and water. The articles should go directly from this to the tinning flux.

SHRINKAGE OF THE ANTIMONY-LEAD ALLOYS AND OF THE ALUMINUM ZINC ALLOYS DURING AND AFTER SOLIDIFICATION*

By Donald McEwen, M.Sc. (Birmingham).

Objects of the Research.

The importance of the volume changes of metals during and after solidification is gaining more and more recognition year by year, and by the present research it is hoped that a little more light will be thrown on so interesting a subject, which, however, seems to grow more complex the further it is investigated. The attention which the volume changes of metals and alloys are attracting in the metallurgical world is shown by the number of researches which have been published lately on this subject.

Total shrinkage has also received a fair share of notice, though it imperfectly indicates the value of a given material for casting purposes, since it gives only the algebraic sum of the volume changes after casting, whereas the nature and rate of shrinkage are also important when the casting properties of a metal are under consideration.

In the recent reasearches of Wust (1) on the shrinkage of metals and alloys, volume changes were measured with an extensometer of novel design, the motion of two pins, one at each end of the test bar, being conveyed to a graduated capillary tube by hydraulic pressure by means of cylinders, pistons, and connecting pipes. With this instrument a large number of metals and alloys were tested, and to some of the results reference will be made later.

Degens (2), working on the tin-alloys, measured volume changes in a modified form of dilatometer, which appears to be quite satisfactory for alloys of low melting point. His results, however, can hardly have so great a technical value as those obtained by Wust, and still earlier by Turner (3) and by Keep (4), where the test bars were cast in sand moulds, so that the conditions of casting and cooling approximated closely to those obtaining in actual practice.

Mr. M. T. Murray (5), a former Bowen research scholar of this university, has investigated the volume changes of the copper-zinc alloys during solidification, and has suggested the possibility of plotting the solidus curve on the equilibrium diagram of these alloys by means of the amounts of expansion shown on solidification which are in proportion to the distances between the solidus and liquidus for all alloys containing above 40 per cent. copper.

This theory having been started in connection with the brasses, it was thought that its applicability to other series of alloys should be tested.

Part I.—The Antimony-Lead Alloys.

Some preliminary shrinkage curves of these metals and alloys having been obtained by Murray, it was decided to begin with the investigation of this series.

Wust (1) has determined the shrinkage curves of the pure metals, antimony and lead, but otherwise no records of previous work on this subject are to be found.

Lead-antimony alloys are of considerable commercial importance, being employed for the production of white metal bearing linings, and for type metals. Small proportions of antimony are also added to lead for hardening purposes, as in the production of leaden bullets.

*From a paper read at Glasgow meeting Institute of Metals, September, 1910.

Preparation of the Alloys.

The metals used were the purest obtainable. The lead was guaranteed to contain 99.95 per cent. of lead, with traces only of bismuth, iron, zinc, and antimony, while the antimony was guaranted 99.5 per cent. pure. A sufficient quantity of both of these metals was kindly presented by Messrs. Cookson of Newcastle-on-Tyne.

In making up the alloys the exact percentage required was weighed out, no allowance being made for loss of antimony, this procedure being justified by subsequent analysis. The antimony was first melted in a covered fireclay crucible (Morgan's H size) over a small coke fire; the requisite amount of lead was added, the alloy well stirred, and the bar cast.

Apparatus Used.

The method of experiment and the apparatus used for observing the alterations in length of this series of alloys were the same as those employed by Turner and Murray (5) in their work on the copper-zinc alloys.

The apparatus consisted of, first, the sand mould in which the test bar was cast; second, the extensometer for measuring the changes of length; and third, the pyromoter, which recorded the changes of temperature (5).

Owing to the small size of the test bars, namely, half-inch square section, cooling was too rapid to give very satisfactory cooling curves, but the eutectic halt was obtained with all the alloys, and it averaged 228° C., being thus in agreement with the result obtained by Roland-Gosselin (6).

Assay of the Bars.—Having been cast, the bars were sampled by drilling at six different points, and assayed. The scheme of analysis at first drawn up involved a volumetric estimation of the antimony by means of potassium iodide (7). After repeated trials this method was discarded, and the lead was estimated gravimetrically as sulphate, the analysis being standardized by running a couple of assays on the pure lead bar.

Rapid solution of the samples was obtained by using a mixture of nitric acid and a concentrated solution of tartaric acid. The antimony was estimated by difference. The results of the analysis are given in Table I.

Table I.

Bar.	Lead by Assay. Per cent.	Antimony. Per Cent.	Expansion (in inches) on 12 inches.	Remarks.
I.....	....	100.0	.0025	....
XI.....	12.3	87.7	.0020	Gate slightly piped.
II.....	22.5	77.5	.0020	Much piped gate.
X.....	31.6	68.4	.0019	Gate slightly piped.
III.....	42.9	57.1	.0000	" " "
IX.....	51.2	48.8	.0015	" " "
IV.....	62.8	37.2	.0000	....
VIII.....	76.8	23.2	.0006	....
V.....	85.4	14.6	.0012	....
VI.....	94.9	5.1	.0011	....
VII.....	100.0	....	.0000	Not piped.

The nature of the piping of the gates of this series of bars was unfortunately not noted in every case, and as many of the original bars were used up in subsequent trials when using a heated iron mould (to obtain slower cooling), such observations were afterwards rendered impossible. So far as could be judged, the piping was largest when the casting temperature was nearest to the commencement of solidification. It will be observed from

the cooling curves that towards the antimony end of the series the head of surfusion is very pronounced.

SHRINKAGE OF THE ANTIMONY-LEAD ALLOYS.

While no expansion was observed in the shrinkage curve of pure lead, pure antimony expands to a considerable extent. These results confirm those obtained by Murray ([5]), and similar values were obtained later when using the mirror extensometer employed in investigating the aluminium-zinc alloys. Wust ([1]), however, has stated that neither pure lead nor pure antimony expand on freezing, but no particulars are supplied as to the purity of the materials employed. The equilibrium diagram of the antimony-lead alloys has been worked out by Roland-Gosselin ([6]), and indicates the total insolubility of the two metals in the solid state, the eutectic halt being present in the cooling curves of all combinations of these metals. The eutectic alloy contains 13 per cent. antimony, and melts at 228° C. All alloys containing less than 13 per cent. antimony consist of primary lead crystals in a matrix of eutectic; with more than 13 per cent. antimony the alloys show primary antimony crystals surrounded by eutectic. Thus the microstructure of the series is very simple.

The shrinkage curves are less easy of explanation. It should be said that the first reading of the extensometer was taken immediately the gate was full of metal. This reading was taken as the zero for the shrinkage curve, so that the changes recorded in this research are due to the behavior of the bar itself after casting, and cannot be ascribed to the mechanical influences of casting, such as wash of metal or jarring. This being so, it is believed that the values obtained represent actual expansion.

Pure lead shows no expansion. On making increasing additions of antimony the expansion increases to a maximum at about the eutectic composition, with 13 per cent. antimony; it then falls to a minimum at about 35 per cent. antimony, whence it rises to a second maximum at about 50 per cent., and, after falling again to 60 per cent. antimony, it increases gradually up to that of pure antimony.

According to Wust ([1]), melts of about eutectic composition show a minimum of shrinkage, which observation serves as indirect confirmation of the expansion maximum noticed at this point. It is not so easy from the equilibrium diagram to account for the maximum found at 50 per cent. of antimony in conjunction with the minima at 35 per cent. and 57 per cent. It should be noticed, however, in this connection that although Bar III. (57.1 per cent. antimony) and Bar IV. (37.2 per cent.) were both cast at a slightly higher temperature than Bar IX. (48.8 per cent.), they show a much more coarsely crystalline and dendritic structure than the 48.8 per cent. bar, in which small white primary crystals of antimony are very uniformly distributed throughout the section. Possibly, then, this is an example of expansion due to an altered form or method of crystallization.

Beyond 57 per cent. antimony the expansion curve rises rapidly at first, and then more slowly up to the highest expansion of the series given by pure antimony, the influence of the antimony on the expansion gradually asserting itself in a more or less normal fashion.

Considering this expansion curve in its relation to the distance of the solidus from the liquidus in the equilibrium diagram, the results are purely negative; a relatively large expansion is obtained at 13 per cent. antimony where solidus and liquidus meet, and from this point to pure antimony, while the distance between the solidus and the liquidus is uniformly increasing, the expansions vary from zero through a maximum to zero again and thence up to pure antimony. The experiments of Mr. Murray, to which previous reference has been made, were conducted on the copper-zinc alloys, which exhibit a series of solid solutions, whereas antimony and lead are mutually insoluble in each other. Possibly the close relation between expansion and range of temperature during solidification may hold only for alloys of metals which are more or less soluble in each other in the solid state. It would appear that the rule does not obtain in the case of metals which form no solid solutions if the antimony-lead series may be taken as typical of such.

It was thought that hardness tests might help to explain the somewhat remarkable shape of the expansion curve already described. The hardness was measured by the scleroscope, invented by Mr. Shore ([8]). This method, when tested against other recognized ways of measuring hardness, has been found to give fairly concordant results for pure cast metals [Turner ([8])], but does not seem to be adapted to tests on non-metallic substances. However, its usefulness for comparative results on a series of alloys such as the present is unquestionable. The great advantage of the method consists in the rapidity with which a number of tests can be made, the specimens being merely pieces about one and a half inches long sawn off from the bars, and tested with the "blunt hammer" on the top surface after removing the rough skin due to casting by rubbing lightly on a fine file.

Up to the eutectic composition of 13 per cent. antimony, the hardness rises fairly uniformly. On passing this point hardness increases much more rapidly, and, passing through a maximum of 17.3 at about 80 per cent. antimony, it falls again very rapidly down to pure antimony. The sharp upward turn taken by the hardness curve at the eutectic composition corresponds with the maximum shown by the expansion curve at this point, and coincides with the first appearance of crystals

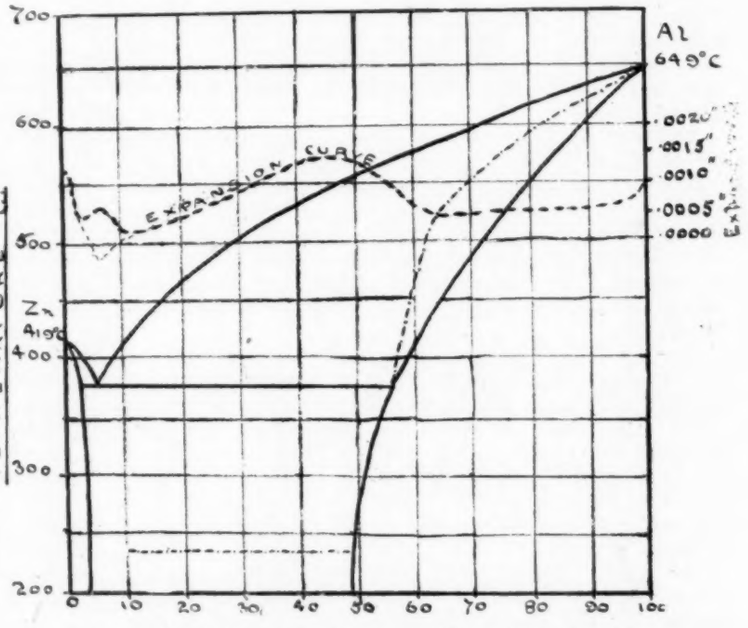


FIG. 1. EQUILIBRIUM DIAGRAM ALUMINUM-ZINC ALLOYS.

of free antimony in the microstructure. Nothing noteworthy is to be found in the hardness curve at 50 per cent. antimony, where the expansion curve shows a second maximum.

Calvert and Johnson, by penetration tests, found that the alloy containing 23.5 per cent. antimony and 76.5 per cent. lead was four times as hard as pure lead.

(To be continued.)

SUGGESTIONS ABOUT SOLDERING.

By O. W. K.

One of the important operations in almost all metal-working establishments is that of soldering and yet it is one that receives but little attention. A little cut-acid, or maybe the raw acid, is brushed on the metal, a soldering iron is passed over it, there is a splutter, the solder flows and the job is done. A simple operation as you read it, and it *is* simple but that is not the whole story. Find a man, if you can, who enjoys the work; one who inhales the fumes of the acid, gets it on his hands and in the little cuts that result from handling metal, and who is at the work day in and day out and ask him how he likes it. He will tell you that acid is mean stuff to work with but he has no choice in the matter for he knows of nothing else to use. Unfortunately this is only too true, not only amongst the majority of workmen, but the majority of employers. They know of nothing to use as a flux for soldering but acid.

Now consider a few of the properties of this acid flux and their bearing upon the factory expense. Rising continuously from this acid on the bench is a vapor that rusts every piece of iron or steel tool in the shop. Examine them and you will find them all rusted. Watch the soldering operation and see the fumes for yourself. Watch the workman squint his eyes and turn away his head to avoid the fumes, and then look at the tools on his bench and the sheets and bars of iron about the shop. They all show the corrosive action of the acid vapors from the soldering flux. Before this rusted metal can be finished up it must have that rust removed. Rusty iron must be cleaned before it is in condition to solder, before it will take varnish or paint, and before it is ready to send from the shop. This is an expense directly attributable to a cause that might have been removed.

When acid is brushed on the parts to be soldered it spreads and when the solder is melted it flows wherever the acid has flowed, with the result that a large proportion of it has gone where it is not needed at all to give strength to the joint. A great wide seam is produced that would be just so effective if it were one-quarter the width and would present a far better appearance. On brass work in particular the excess of solder on a joint is of considerable objection, in that it destroys the neatness of the article and oftentimes must be filed off. All this results in waste, for the solder goes on the floor, the file used for removing it soon clogs and is good for no other purpose, and last and most expensive is the time of the man while he is remedying a fault that is characteristic of most soldering.

Another little leak that results in considerable loss of money in the course of a year is traceable to the corrosive action of the acid during the soldering process, and it is in the *time consumed in rewetting* after the acid has dried on the work from the heat of the metal. When acid is applied to metal, its first action is a cleansing one, but, as it dries out the action is just the opposite and corrosion begins to set in. The evidence of this lies in the fact that when the acid has dried, solder will not flow over it and more must be added. This little operation of adding more acid to remedy the injury from the first application is going on continually and we will allow it takes but a few seconds time, but consider the number of times a day this operation is necessary and then multiply it by the number of working days in a year and see what it means in money at 30 cents an hour.

These are just a few of the conditions actually existing wherever acid or cut-acid is used as a flux in soldering. They are seldom brought to the attention of the man who sits in the office making every effort to keep down expense, the man who is constantly looking for leaks, the man who pays for all the lost time of his workmen and the time they really waste in doing work that could be avoided. The sooner the employer and the workman, for their mutual benefit, look into the question of using one of the high-grade, non-corrosive soldering fluids that of late have been placed upon the market, the sooner will they eliminate one of the apparently small, but actually large leaks in the factory expense and get better results in the finished work, to say nothing of the improvement in the atmosphere breathed by the workmen.

NOMENCLATURE RUN RIOT.

By W. H. Parry.*

Is it not time to call a halt on applying terms to animate or inanimate things mechanical; for instance, around the vicinity of New York they are now calling young men, who are unfortunate enough to be learning the so-called patternmaker's trade, "improvers." Ye gods! What do they improve? Is it time, lumber, or the patience of the foreman? For the life of me, Mr. Editor, "this is the unkindest cut of all." As if it is not enough to go through life labelled a patternmaker without the added odium of once having been an "improver." Would not "learner" be more to the point; it certainly conveys to the lay mind at least, he or that which is learning and not he or that which improves, the ways and means of present day practice, as the best of contemporaneous lexicographical authorities most certainly define it. Again, what does the term patternmaker convey, think you? A maker of patterns, you say. True enough, but what kind of patterns, wood, metal, plaster, or is it paper patterns of women's dresses. Why not call him a "patternist" or a "patterner" to make a distinction between the cutters of hobble dress patterns and the hewers of wood or metal to suit the vagaries of either sketch, blue print, word of mouth or an old broken casting? Then that finely drawn distinction between machinist and toolmaker; certainly, if a machinist is a maker of machines, a maker of tools should be a "toolist" or a "tooler."

Another cause of dissension in most shops is the lack of proper terms for the departments where tools are made as against the sanctum sanctorum where they are stored. The word toolroom can be applied with more or less accuracy to both, though it designates neither properly, thus we could call the one the toolists or toolers and the other toolkeepers, the latter term being particularly applicable, as it not only designates where they are kept, but hints broadly at their being kept sharp.

The molder and the patternmaker,
They seldom, if ever, agree,
And neither seems to hanker
For the other's companee.
When I go down "six feet" to rest,
This be my epitaph, I implore,
"This patternmaker did his darndest,
Angels could do no more."

* Superintendent National Meter Company, Brooklyn, N. Y.

SPECIAL TOOLS FOR THE BRASS SHOP.

By Ethan Allen.

The Turret Chucking Machine is recognized as a rapid production tool when equipped with proper tools, but has been rejected by a great many of the smaller shops on account of its limited range as compared to a Universal or Fox lathe. The writer has found that in a shop doing a general brass manufacturing business and using three or four turret lathes it pays to have at least one chucking lathe. This chucking lathe should be equipped to handle either bar work or castings and to do so must be equipped with automatic chucks or split collets, wire feed mechanism and a good two jaw screw chuck with inserted jaws, as they permit of wide variety of work being held in the chuck as special jaws can be made to fit irregular work. The cost of these special jaws is not too great to prohibit their use on a small lot of pieces as they can be made of a cast iron shell and a babbitt mold made in them carrying an imprint of the casting to be chucked.

work it was necessary to add to the standard tools usually supplied, several special designed tools to use as a part of its general tool equipment in order to handle the average work.

One line of work that has been out of range of regular tools has been such pieces as have a recess similar to stud shown in Fig. 1. To machine these we use recessing tool shown in Fig. 2. This tool is an adaptation of the well-known back rest type of box tool and it is not an over expensive tool to make if the shop is provided with an ordinary tool room equipment, as, for instance, a lathe, drill press and milling machine or shaper.

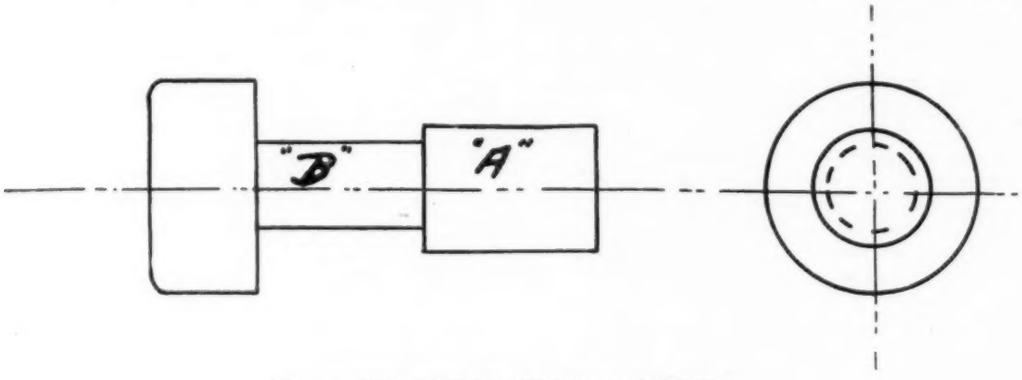


FIG. 1. STUD SHOWING RECESSED DIAMETER.

In operation the cutting tool slide is adjusted so as to turn diameter "A" and when tool has reached the point where diameter "B" starts the traverse of turret is stopped and cutting tool slide advanced in towards center until proper depth is reached, which is denoted by the adjustable stop on the cross slide of tool when the turret is advanced to the end of the cut and then the tool slide is returned to cut diameter "A" and turret returned ready for another cut. This tool capacity can be enlarged to turn two or more diameters by placing additional plain cutter blocks and back rests at the rear of recessing tool slide. The proportions of this tool must be determined to suit the class of work of the shop for which it is intended.

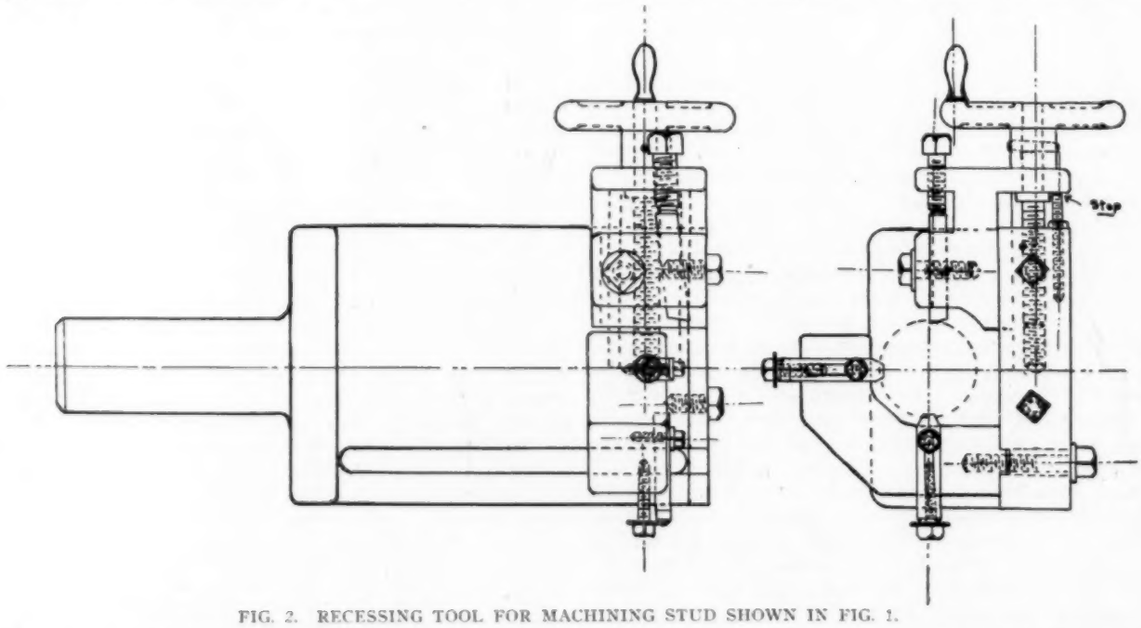


FIG. 2. RECESSING TOOL FOR MACHINING STUD SHOWN IN FIG. 1.

On the rod work equipment it is very much more economical to have collets of the inserted jaw type as then special sizes or even shapes can be easily handled and cheaply by making up a set of jaws which cost considerable less than the solid collet, and better still, can be made in shop toolroom without the inconvenience of awaiting on the manufacturer for them when in a hurry. To accomplish the maximum amount of

MANGANESE BRONZE

A Description of a Practical Method for Making this Alloy Never Before Published.

By W. R. Dean.*

(Concluded from January.)

VARIETIES OF SPELTER.

Now in regard to the different spelters mentioned in the first part of this paper, namely: Horsehead, White Bronze and Golden Rod, I wish to say that there is very little difference in their composition as shown by chemical analysis. They are all exceptionally good spelters and compare very favorably with Bertha, in fact I have had almost as good results from these brands as from Bertha. I have had upon occasion higher tests with Horsehead than with White Bronze and higher with White Bronze than with Golden Rod, still the difference between them is so slight that the order of these might be very well reversed and bettter tests be obtained with Golden Rod than with the others. All of these brands are cheaper than Bertha and unless the requirements are exceptionally severe, by a careful mixing and melting all fair requirements can be met when using these spelters. At one time I used Golden Rod spelter almost exclusively and met all requirements that were demanded, but having tested out some Horsehead I got better results and so then changed over to the latter brand. On recent analysis of Golden Rod spelter I find it to be exceptionally good and although I have not tested it out lately I could no doubt get higher test results with it. I give here an analysis of Golden Rod.

Zinc	99.952	per cent.
Cadmium	.037	" "
Iron	.008	" "
Lead	None.	
Copper	None.	

MAKING THE MIXTURE.

FORMULA.

Copper	56	pounds.
Zinc	43	pounds.
Alloy	2½	pounds.
Aluminum	8	ounces

This is a standard formula for general purposes but may be varied to meet different specifications. By increasing our copper content we increase the elongation but decrease the tensile strength. The formula can be changed to copper, 62; zinc, 43; alloy, 2½; aluminum, 8 ounces; which will give in a chilled test bar 75,000 pounds tensile strength, 35,000 elastic limit and 30% elongation, while the other formula would give 80,000 pounds tensile strength, 40,000 elastic limit and 18-20% elongation.

Following is a graph for the first and standard formula, this graph is read the same as the one for the alloy, the zinc and alloy being read in pounds up and down, the aluminum read in ounces vertically and copper on the base line.

The making of the bronze is difficult; to get the best results, it needs careful supervision and cannot be left to any one to melt. The heat should be in charge of a conscientious, reliable melter, one who thoroughly understands manganese bronze alloying or else do it yourself if you want the highest tests.

Put a handful of charcoal in the bottom of the crucible and then one pig of copper, after this is melted add the alloy and allow it to melt, which will take several minutes depending on the style of furnaces, the pit furnace taking longer than oil or the M. R. V. After it has started to melt stir it thoroughly. When it appears to be all melted add the aluminum and the heat given off by this addition will melt any alloy left. After this the rest of the copper is added and when melted the zinc is added and the whole mixture brought to the required temperature.

Some advocate the making of the bronze and "pigging" it and remelting to pour into the casting. While this improves the quality of the metal and gives a better casting it adds to the expense. I have had excellent results from pouring right from the new mixture but to do so I watch my metal constantly and do not let the metal soak or get too hot. I would advise any one just starting to make manganese bronze to "pig" it and pour the castings from the pig metal.

The aluminum in manganese bronze does away with the dross caused by the excessive zinc content and causes the metal to flow into the most minute crevices

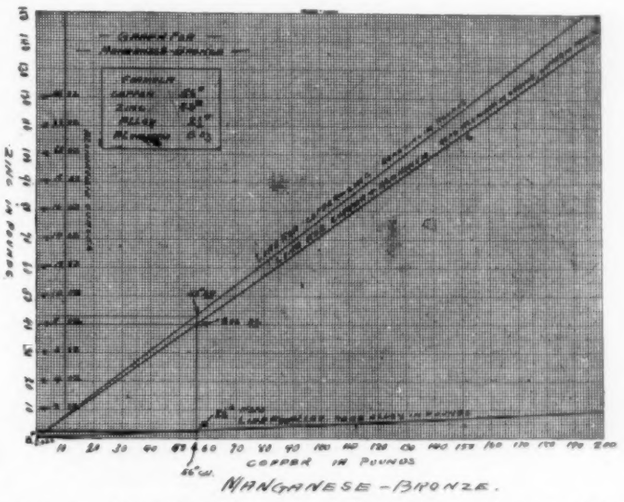


FIG. 1. DIAGRAM FOR A STANDARD MIXTURE FOR MANGANESE BRONZE.

of the mold. Without aluminum the formula given could not be used as the metal would come drossy and have the appearance of metal that did not want to run together.

The melting of manganese bronze requires careful attention, it should not be allowed to burn or soak, the metal should be well covered with charcoal and a handful of salt is of great benefit. Some use sal-ammoniac. While sal-ammoniac is good for zinc as flux it isn't as good as salt. Salt is especially good when gates and risers are used which have more or less dirt attached.

It is a good place here to take up the use of gates, risers and chips. Some makers of manganese bronze make the new metal separate without using gates and risers and never mixing the two. I never could see the advantage of this as it takes longer to take down a pot of new metal than it does to take down a mixed

*Foundry Foreman, Peck Bros. Company, New Haven, Conn.

one, by that I mean half scrap and half new. After one has had some experience in making new metal so as to understand it and has accumulated scrap, the heats can be made in this manner: Put gates and risers in the bottom of the crucible first, say in a No. 50 crucible 40 or 50 pounds, when this is melted add the copper of a new heat. Add the copper slowly at first, one pig at a time, and then putting them all in the pot without allowing the heat to freeze up. The melted bronze in the crucible will aid in melting the copper quicker than if the copper was put in first. I have done this for years and know it to be so. Some may doubt it. I know of one place when the man in charge who had been there and did it the other way for years was skeptical about it. This mixing of the old and new doesn't impair the quality of the bronze either but really helps. One foundry that has been making manganese bronze for 18 years and have had the greatest success do their melting in the way outlined above.

In using chips, the putting in of the chips depends a good deal on the kind of furnace used, in an oil or coke furnace the best time is to put the chips in first and then the copper or gates and risers on top. The gates in melting cover over the chips as they melt keeping down the chimney loss to a minimum.

Manganese-bronze chips should not be bought in the open market as there is too much chance for the substitution of a poor quality of chips. Most foundries that make their own chips use them over again, some in the better quality bronze, but mostly in work that does not undergo the highest tests. If a large quantity accumulate it is better to cast them in pigs first before using them. In this way a more homogeneous casting results with less oxide. In using up gates and risers about 3 per cent. of zinc to the 100 of mixture should be added to take the place of that which has been burnt out during the previous melting. This is the usual loss, by careful melting this loss is sometimes lower and then 2 or 2½ per cent. are enough. This loss can be obtained by constant analysis of test bars if one has a chemical laboratory connected or convenient. In using chips I would not advocate using over 20 per cent. of the best quality of bronze.

MANGANESE-BRONZE FOR FORGINGS.

Manganese bronze for forging differs from the formula for casting bronze in the proportion of spelter. The copper content is higher and the spelter lower. A good many give the formula without aluminum but I have made forging ingots with aluminum and have had the best results, the aluminum acting as a deoxidiser and improving the quality of the metal.

FORMULA FOR FORGINGS.

Copper	60 per cent.
Spelter	38 " "
Alloy	2 " "
Aluminum	4 oz.

GATING THE METAL.

Manganese bronze requires heavy gates and risers. Risers are necessary as the large amount of zinc causes excessive shrinkage. In gating a casting for this metal, the gates should be put on so as not to form eddies in the casting. If the metal enters the casting so as to form an eddy, a drossy casting is sure to result. The easier the metal enters the casting the cleaner it will be. From the pouring sprue to the riser a long gate should be cut so as to have the metal enter the casting quietly, this gate should not be too large as the metal is then exposed to more or less air and forms an oxide. A riser is put on between the runner and casting to let all dross formed during the pouring and drop of the metal escape before entering the casting. The gate from this riser in front of the casting, should be of good size, so as to allow the metal to enter without forming dross. It should also be large enough to keep the metal from freezing and choking the supply of hot metal from the riser, which is acting as a reservoir and feeding the casting as it shrinks in cooling. Whenever possible, the gate should be on the heavy end, as the thin parts cool first and draw from the heavy, which stay hot longer. Likewise, near or on the heavy part there should be a big shrinker or riser, and this should be large enough to cool after the heavy part on the casting has cooled.

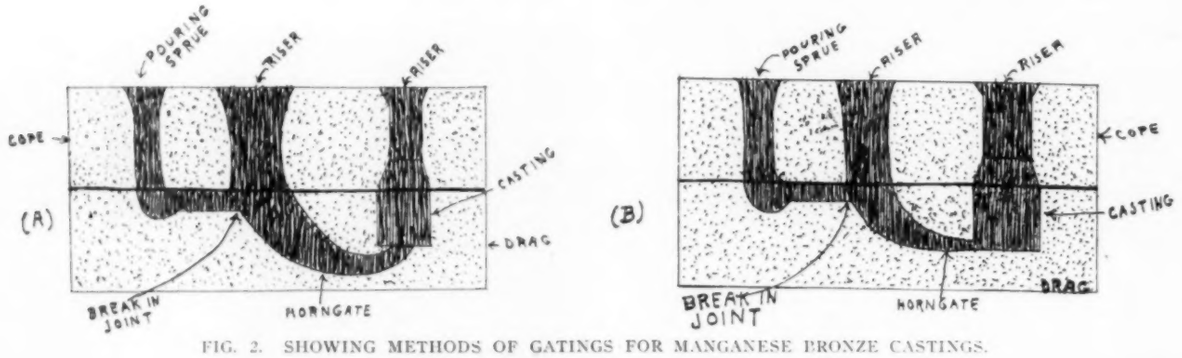


FIG. 2. SHOWING METHODS OF GATINGS FOR MANGANESE BRONZE CASTINGS.

If one desires to churn the riser, it need not be as large as it would have to be if churning was not resorted to. By churning we force the melted metal down into the casting and pour in hot metal to take the place of that used in feeding the casting as it shrinks. This is carried on until the riser has frozen above the top of the casting. The churning method insures sound castings as the pounding together of the metal makes the mass more homogeneous and stronger by crowding the molecules closer together. On big castings, churning is the surest way and one does not take as many chances of finding shrink holes after sawing off the gates and risers. Also it would call for so many risers and such big ones that it would be a job sawing off these risers. Churning is much cheaper than sawing.

MAKING THE MOLD.

In making a mold for manganese bronze, the sand must not be too wet, because this causes drossy castings. Also the sand must be worked as dry as possible

and not rammed too hard because blow-holes are sure to result. The sand should be rammed lightly or the metal will not lie quietly and dross is formed.

In gating manganese bronze, either in bench or floor work, the horn gate is one of the most useful forms of gates. The horn gate should have a nice sweep, not too sharp and can be used either directly against or under the casting or used in conjunction with the gate. A sketch of various gatings is shown in the cuts.

Some founders do not advocate the use of the horn gate for such work. I do not advocate it in anything but manganese bronze. It is very useful in this alloy on account of the excessive amount of zinc. When there is a drop for the metal dross is formed, this is somewhat broken by a break in the joint with the horn gate and the metal runs easily through the horn gate to the casting. This break in the joint is not necessary except when the horn gate is directly against the casting. Fig. 2, A. & B. A riser should be put over the horn gate to act as a feeder to the casting. The horn should be of fairly good size at the neck unless the casting is to be churned and then it can be much smaller. In case the riser over the horn gate is to hold up the casting, the horn should be of good size at the neck so as not to freeze and stop the riser from feeding the casting. If the neck of the horn gate freezes before the casting is solid a shrink in the casting will result.

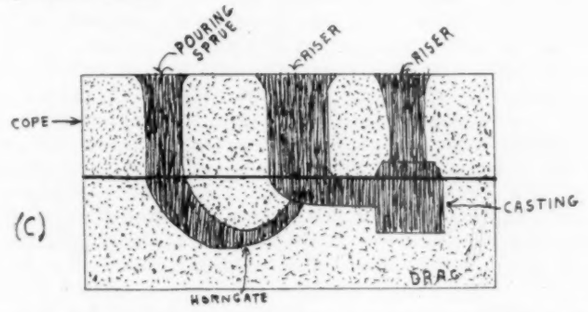


FIG. 3. GATING A MANGANESE BRONZE CASTING BY A HORN GATE UNDER THE RISER.

Churning is by far the most satisfactory way of holding up fairly large castings. There is too much opportunity for draws and shrinks to occur if churning is dispensed with. I have worked in foundries where churning was done on every casting of any size and shrinks were practically unknown. Then again I have worked in foundries where churning was never done and shrinks and draws were common. Ten per cent. of the defective castings were due to this cause alone. Under the pouring sprue and the riser on the gate should be put a good saucer-shaped hole to catch the first drop of the metal when dross is formed. After this disturbance when the metal begins to flow in to the casting it goes in quietly.

POURING THE BRONZE.

To be able to pour manganese bronze correctly is very essential. A good many castings are spoiled by poor pouring. Some of the many ways a manganese bronze casting may be spoiled by pouring are:

First. Poured too cold; do not pour after the metal ceases to flare slightly when the surface is disturbed by the skinner, by flare is meant the combustion of the zinc oxide that is produced by the stirring or agitation. The result of cold pouring are well known to all foundrymen—shrinks, draws, cold shorts and miss runs.

Second. Poured too hot, dirty metal, low tensile strength, also "draws." A draw can occur with metal too hot as well as with too cold, by too hot is meant when the pots are smoking like yellow brass.

Third. Poured too slow, miss runs, manganese bronze on account of having to be poured colder than any other metal is more apt to miss run and not fill out the corners. Great judgment is necessary and experience only will give one good judgment; if poured too hot dross forms and a dirty casting results. Forcing the metal starts the zinc oxide and it shows in the casting. It is the hardest metal of all to judge in pouring because the least variation in pouring very often causes trouble.

In pouring, usually the operation should be started slowly. If the casting is a thin piece, when the metal has reached the casting it should be poured hard and the pouring sprue kept full until the metal is over the casting and then poured easy until the risers are full and fed a bit to take care of the shrinkage if churning is going to be done. A heavy piece should be poured easy at all times, that is just hard enough to run the casting. The pouring must be judged by the thickness of the casting and thus judgment comes only by experience. The pouring of any metal requires judgment, but manganese bronze more than any other metal. The easier manganese bronze can be poured and the casting run, the cleaner and free from dross will the casting be.

RECOLLECTIONS OF DR. HEROULT.

On the occasion of January 20 of the presentation of the Perkin Medal to Dr. Charles M. Hall at the Chemists' Club, New York City, Dr. Paul Heroult, who was the co-discoverer with Dr. Hall of the present process for aluminum production, was present and gave an interesting address regarding his own early experiences in the manufacture of aluminum. At the opening of Dr. Heroult's address he quoted from Kipling as follows:

"Ship me somewhere east of Suez,
Where the best is like the worst;
And there ain't no ten commandments,
And a man can raise a thirst."

saying that the quotation represented his mood when he made his first acquaintance with aluminum in large quantities. At that period Dr. Heroult, together with his partner, were financially embarrassed and had had occasion at different times to resort to their avuncular relative of the three balls. Just about the time when they had reached the rock bottom in things pledgible Dr. Heroult's partner stumbled upon a stick of aluminum which was held in high esteem in his family as a souvenir of St. Claire Deville. On presenting this to the pawnbroker he asked if it was bar silver. Dr. Heroult replied that it was better than that, it was aluminum, but that answer meant little to the pawnbroker, as he was unacquainted with the metal. After looking over the bar for some time and wondering at its lightness, which he thought was due to the fact of its being hollow, he finally presented the two impecunious metallurgists with two francs, amounting to about forty cents in American money. This was the first connection of Dr. Heroult with aluminum and probably, as he remarked, was what finally caused him to strive so industriously to solve the problem of its manufacture, as he was under obligations to replace the pawned stick.

Dr. Heroult then sketched briefly the history of the development of the aluminum industry in France.

THE CASTING OF GERMAN SILVER.

THE ANNEALING OF CLAY POTS AND HOW TO USE THEM.

THOMAS CLARE.

In the year 1865 I started in to learn the business of metal mining and melting or, as we call it in Birmingham, strip casting. That was at Evans & Askins, George street parade, now called, I think, Wiggins, Son & Johnston. I worked for a man named Philip Winyates, who thoroughly understood the business. We used clay crucibles and I had to get to the shop at six in the morning to get the pots up, that is anneal them and have them turned and all ready by the time Mr. Winyates arrived at eight o'clock.

It is quite a trick to anneal a clay crucible without warping or bumping it. The best way to anneal a clay pot is to clear the fire bars of all clinks, light the fire and just as soon as the fire is well started, cover it well with coke so that you cannot see any fire, then put in the pot upside down, put coke around it covering up the bottom of the pot with coke. Now place the furnace cover about half way on, and so let it burn up slowly, because if the fire gets hot too quick the pot will either bump or warp, in either case the crucible is spoiled. As soon as the bottom of the pot is red hot it is ready to turn. The pot is turned right side up and a little coke put round it, just enough to keep it in position and it is then ready to charge.

Evans & Askins manufactured nothing but German silver in all the different grades, and entirely different methods were used from those of the present day. First we took the copper and spelter of equal parts, melted and mixed well and then poured into pigs. Now melt and mix one part of copper and two parts of nickel and pour into pigs. The first is called pig brass and the second mixing. The German silver of all grades is made from the brass and the mixing.

If the German silver you are making should be half scrap and half new metal you will put in the bottom of the crucible a good layer of pulverized charcoal. Then put in a charge of scrap and some more charcoal. While getting in the scrap put in the charcoal from time to time. When all the scrap is in the pot place the pig brass on top of it inside the pot. Then put some fire around the pot. Never let the fire go down or your pot will get cold and will crack. Get the mixing hot by placing it in some safe place, then when hot enough put it into the pot and push it under and into the melted scrap, lift up the pot with the pot tongs, and put coke all around and a little on top. Put on the cover and allow to burn. In about half an hour this fire will have gone down, then you will take the stirrer and stir the metal well and find out if the mixing is all melted; if so give it a good stirring and then let it rest awhile before giving it another good stirring and pour when hot enough. On no account let German silver stand in the furnace after the metal is ready and hot enough to pour.

GERMAN SILVER MADE IN GRAPHITE CRUCIBLES.

The best way to make German silver in black lead is to be sure that your formula is right and to have it right. The best and safest way is to weigh it out yourself. Get your crucible hot, then put in a good layer of pulverized charcoal, put in the copper, the nickel, and borax for a flux, then a little more charcoal, put on the pot cover and keep up a good fire. When the copper and nickel is melted or nearly so take the stirrer and feel it (use a graphite stirrer if possible). Be sure the nickel is melted as it is liable to deceive anyone, since it will swim around in the molten copper and it is hard to feel it. When you are sure that the nickel is melted stir well, throw on some more charcoal and get in the scrap. While doing so put in a little charcoal from time to time. When the whole of the scrap is in, build up the fire and let it stand until hot. When hot enough put in the zinc and stir well.

Great care should be taken with regard to getting in the zinc; have the metal hot enough, but not too hot. If too hot the zinc will blow all the charcoal off and some of the metal will boil over. If the metal is not hot enough the zinc will form in a lump and when skimming it will be skimmed off. In either case the formula is ruined. When pouring be sure to have the metal the right heat. This is most important and is the only way to obviate spilly and hollow metal. It is something every melter should know. To teach a man you should be right with him and show him, for you can hardly make a man understand by word of mouth. Then again there is a great deal in pouring the metal. One must keep up a continuous stream, not stop and start, not faster and slower, but an even stream, until the mold is full, then when pouring stops, start feeding as quickly as possible.

THE POWER REQUIRED IN THE PLATING DEPARTMENT OF A HARDWARE MANUFACTURING PLANT.

In a recent investigation regarding the feasibility of replacing several independent power plants with one central plant in a large manufacturing concern the engineers, Lockwood, Greene & Co., of Boston, had occasion to determine accurately the power requirements of the various departments. As their tests were carried to a great degree of refinement some very interesting data was collected concerning the amount of power required for certain individual machines and groups of machines.

The information they obtained in regard to the power necessary to drive the equipment in the plating department is of particular interest as there is a great scarcity of such data. In the hardware plating department the equipment included one 60-in. Sturtevant exhauster, one 1,500 ampere plating dynamo, two plating rolling barrels and four small brush lathes. Tests showed that the plating barrels and lathes could be started with 8.1 h.p.; the exhauster, the four lathes and the dynamo running free required 6 h.p.; the two plating barrels required 6.7 h.p.; operating all the equipment and supplying 600 amperes at six volts to the barrels required 14.6 h.p.

In the fork and handle finishing department it was found that 100 polishing and grinding wheels required about ½ h.p. each. In the cutlery plating department tests showed that the average power consumption of the nickel tanks was 0.65 h.p. each, of the silver tanks 0.68 h.p. each and of the stripper tanks 0.70 h.p. each. For this class of work a general allowance of 0.70 h.p. was made.

PRODUCTION OF THE CLOUDED BRASS OR COPPER FINISH UPON ART METAL LAMPS.

By Royal F. Clark.*

ROYAL F. CLARK.

One of the most pleasing finishes which is put upon art metal lamps, gas and electric portable reading lamps is the clouded finish of either brushed copper or brushed brass. The shells being spun or stamped will have a black clouded or shaded effect, radiating up and down from a band around its entire circumference, within a space of two or three inches. The center being a very deep black on starting, then gradually becoming lighter until it blends into the brushed copper or brass. It should have the appearance of a cloud in the sky, which is deep or dark in one place and which becomes lighter until it fades away entirely, hence its name "clouded brass or copper." The trimmings, such as the base, band, ornaments, handles and crown will be finished in either brushed copper and black or brushed brass and black, as the case may be. Undoubtedly the method of producing this finish has baffled many an electroplater.

Take, for instance, an art metal lamp, having two spun copper, brass or zinc shells in its make-up. No matter how fancy the shape of these shells may be, there is, generally, a brass or white metal band of some design, such as the "Wall of Troy," or a beaded one, placed between the two shells. Placed upon the top of the upper one is the crown, either of cast iron, brass or spelter. The lower one is set upon a base made of any one of the above three metals. The copper finish will be described first. If the spun or stamped shells are of brass or zinc they are given, after the surface has been "cut down" and "colored," a cyanide copper plate of about ten minutes, then transferred to an acid copper bath and allowed to receive a heavy deposit. Next they are brushed lightly to give them a uniform bright surface with a steel scratch brush, three inches in diameter, four rows in width. One which has been worn down or "broken in" must be used, using a little carbonate of sodium in the water, keeping the shell well wet during the brushing. Next a small amount of flour pumice is mixed into a paste with water, and put some upon the brush which should not run too fast, also all over the shell. Brush carefully all over the surface and have the brush marks running in the same direction, this makes the surface dull. Clean the punice out of the brush by putting water upon it with the hand several times and proceed to brush the surface lightly, always in one direction, using very little water, until the surface has a uniform dull color, yet having some life in it. The shell is now put in boiling water to which has been added a very small amount of plater's compound—this facilitates in the drying out—then in clean, hot sawdust. There must not be any water stains upon the surface. Do NOT lacquer this now.

The clouding can be done in three different ways. One is to apply a slow drying varnish over the entire outside surface of the shell and just before it is quite dry, or it has become "tacky" it should be held over the burner of a gas bracket turning the shell around carefully, this produces a black smoke or soot which adheres to the varnish and dries in with it. It is very difficult to produce that blending effect via this method. Or the shell may be placed upon a small revolving table, such as china decorators use, and then have a rubber gas hose attached to a gas bracket on the side wall and extend this to where you intend doing the clouding. Upon the other end of the hose have a small piece of pipe of brass, about three or four inches long, inserted in the hose, and taper to an opening of about one-sixteenth of an inch in diameter. Place the shell securely upon the table and revolve it slowly. Commence at the bottom of the shell, holding the flame, which will be long and round, near it until it produces a deep black smoke or soot around the circumference of same, then gradually, with one sweep of the flame, raise it up and away from the shell. When you have shaded far enough, repeat until it blends nicely. It will require some practice at first to acquire the manner of even blending. If not blended right or if it has gone too far up on the shell wipe the smoke off with a soft cloth and repeat blending. If it has to be wiped off too many times, it will become soiled with black streaks and must be brushed over again. The metal will have become heated a trifle and must be set aside to cool before lacquering. A stoneware crock makes a good receptacle for the lacquer. A good grade of heavy dip lacquer must be used. It should be used for the smoked work only, as after considerable smoked work has been lacquered in it the lacquer becomes dark and dirty from the slight amount of soot which will go down with the drip. After the shell has been clouded it must be handled carefully and nothing must come in contact with the smoked portion. Even jarring the shell will cause the soot to separate and show white specks when finished. As soon as cool it should be immersed very slowly, gently and evenly into the lacquer, using a wire hook most convenient for holding that particular shape of shell. Then take out very carefully and allow

EXAMPLE OF SMOKE FINISH ON BRASS.

* Foreman Electro-plater. Thos. J. Dunn and Company, New York.

to hang directly over the jar until through dripping. It is then dried in a lacquer oven. When thoroughly dry the shell is finished and may be handled as much as desired without spoiling.

The writer has found that in order to procure the best shading, a wooden chuck or form should be made, such as the spinner uses, on which he spins the brass shells, to conform with the shape of shell it is wished to cloud. Attach the chuck or form to a small spinning or speed lathe and have it running at a very slow speed, not more than about fifteen to twenty revolutions per minute. It must be remembered that the shell must revolve very slowly or the smoke will not adhere. As the shell revolves, hold the flame on the under side so that the smoke will adhere and gradually move it to the right following the shape of the shell as far as the shading is wanted and then drawing away quickly. Repeat until at

EXAMPLE OF SMOKE FINISH ON COPPER-PLATED CAST IRON ORNAMENT.

the beginning it is a deep black and then allow it to get lighter on the way to the smoke limit until it fades away entirely. When cool proceed to lacquer according to above directions.

The brushed brass shells are done in the same manner. If zinc ones are used, brass plate them heavily. The trimmings, such as the bases, crown, band, ornaments and handles are finished as follows: No matter what the metals used for making the above are, get the brushed copper or brass finish, but do not lacquer them. All these articles must have a back ground (or deep crevices) in them. Brush the articles with a black lacquer, either the "dead" or "rubber" finish will answer. Immediately after all the crevices have been black lacquered take a cloth, dampen it with thinner, and rub all the black lacquer off of the high lights, leaving the black in the crevices. Where occasion requires the black may be stippled in with a brush. Wipe the high lights or raised portions off thoroughly leaving a nice clean brushed brass or copper finish. Allow to dry and then brush lacquer the whole with a good heavy clear white lacquer. The trimmings are then ready to be put up on the shells. Before clouding, if desired, the shells may be given a coat of black nickel or any other black oxidize, either on the brass or copper; then brushed, relieved and blended with a Tampico brush and the smoke put over this which has a tendency to cause the heavy smoke to appear quickly at the beginning.

Many a plater no doubt has tried to produce this beautiful "clouded" finish entirely by oxidizing and then blending with the brush, but it is impossible to blend it as perfectly as the flame of gas will. In conclusion let it be stated that to produce this finish it requires careful manipulation as to the speed of the revolving shell, size of gas flame used, quickness in putting on the soot or smoke, blending delicately, and lastly the lacquering which is one of the most important operations, as the soot will be marred if immersed too quickly. The illustration shows a cast iron ornament or handle for an art metal lamp which is finished in brushed copper and black; also a spun brass shell having the clouded brush brass finish upon its surface.

NEW GALVANIZING WORKS IN ENGLAND.

Galvanizing works have been started at Magnet Wharf, Stratford E. to operate Mr. Sherard Cowper-Coles' latest patents in connection with electro or cold galvanizing. It is claimed that the Cowper-Coles improved process of electro or cold galvanizing enables articles to be galvanized at a very low cost, as the labor is greatly reduced in the preparation of the metal for galvanizing and also in the actual process of galvanizing. The output for a given capacity of tank has also been largely increased and work can be galvanized in a very short time compared to the older methods. The electro or cold process also has the advantage that it utilizes the by-products of dross formed by the hot process and the combination of the two processes enables articles to be treated very cheaply and efficiently.

The Magnet Galvanizing Works are divided into three departments:—A department for electro or cold galvanizing, fitted with special mechanical appliances enabling tubes, bolts, nuts and similar articles to be treated automatically with little or no handling; a department for the improved hot galvanizing process, and a department for brassing, coppering and bronzing all classes of iron and steel goods for ornamental and protective purposes.

The process of electro or cold galvanizing has its special fields of application, and has largely increased the galvanizing industry, as by the cold process, zinc can be applied for protective purposes to many objects which can not be coated by the older method of hot galvanizing or dipping in molten zinc.

ALUMINUM MANUFACTURE IN ITALY.

From United States Vice-Consul Kenneth Stuart Patton, Rome.

A concern at Bussi di Tirino, Province of Aquila, is the sole company in Italy manufacturing aluminum. This factory utilizes 3,933 horsepower, generated by 18 electric motors, and employs 210 men.

ETCHING METALS BY MEANS OF IMPRESSIONS TAKEN FROM ENGRAVED COPPER OR STEEL PLATES.

By M. Schweizer.*

To carry out this process a copper or steel plate is first engraved with whatever design it is desired to etch. From a plate so engraved an impression is taken with an ink made of boiled linseed oil, thoroughly mixed with dry Venetian red so it will make a thick putty, like printers' ink. With this the engraved design is filled in by means of a tampon made of soft leather. The superfluous ink is wiped off with a soft cotton rag. An impression is then taken on a good quality of manila paper by laying the paper onto the plate and running it through a two roller press, using considerable pressure; then the paper with the impression on it is lifted off the plate, and while good and fresh is transferred to the article to be etched, and rubbed on from the back with a steel burnisher, using a little plumbago, so that the burnisher will slip over the paper easily. The paper is now taken off and the design will then appear on the article to be etched. From the same impression three transfers can be made.

If the etching is to be sunk into the metal, the article with the design on it is covered with an alcohol acid resist varnish, and after this is thoroughly dry the printed design is washed out by means of turpentine, camphine or benzine, using a piece of soft cotton wool. After the design has been washed out clean, the metal in the design is free from all acid resist coating and can now be etched with an acid suitable for the metal; if, however, the design is to be raised, as soon as the impression has been transferred to the metal, it is to be dusted with some etching powder, either asphaltum rosin or dragons-blood and heated over a gas stove sufficiently to melt the powder. This operation has to be repeated on the four sides of the design. Remember that in brushing over the metal with a camel's hair brush all superfluous powder has to be thoroughly brushed away so that none will remain except what adheres to the lines of the design. The metal article after all the exposed parts, except the design as well as the back, have been covered with an acid resist coating, is ready for the acid bath.

The first etching should continue only a short time. The article is now well washed under a faucet and dried. When thoroughly dry the same operation of dusting is repeated and again put into the acid bath. This time the article may remain in the acid bath a somewhat longer time. These operations of dusting and melting must be continued until the article is etched sufficiently deep, after which the article is thoroughly washed in water and cleaned off in potash, benzine, turpentine or benzol. Brass articles should not be cleaned with potash, as this will tarnish the metal. A printing ink for raised etchings may be prepared which is acid resist in itself, and all dusting in and melting of the resist powder can in this way be done away with. For this printing a hardened steel plate may be used, and the design drawn in with a scraper and etcher's needle, or a drawing in black and white may be used. A negative is taken from this and then printed onto a steel plate, which first has been coated with a sensitive solution. When the solution is dry (the drying is done by means of heat in the dark room, if a sensitive asphalt coating has been used, this may be left to dry in the dark room without the aid of heat, the negative, together with the sensitized plate is put into a printing frame and exposed to the sun or artificial light. If the sensitizing solution is of chromate albumin an exposure of three or four minutes may be sufficient; if of asphaltum an exposure of an hour and a half or two hours may be necessary. After a chromate albumin plate has been sufficiently printed it is taken back to the dark room, rolled up with etcher's ink, and put into a tray of water; the design is then washed out with some cotton wool, and when thoroughly dry it is dusted over with etching powder. This is then melted and after all parts, where the acid is not to act upon, are covered with resist varnish and this is perfectly dry, the etching can be proceeded with. When the etching is deep enough so that the nail of the thumb can catch a fairly good hold of the lines of the design, the plate is cleaned off in hot potash and is then ready to take impressions from.

When the steel plate has been coated with sensitive asphaltum and has been exposed to the light in the same manner as the chromate albumin plate for an hour and a half or two hours it is taken back to the dark room, laid into a mixture of lard and kerosene oil, in which it remains until the design appears in brown color. A piece of cotton wool is then dipped into the mixture and the plate is carefully rubbed over with this, backwards and forwards and crosswise, until all the asphalt not acted upon by the sunlight has been washed away. The plate is now taken out and all the oil thoroughly washed off under a faucet, after which it is exposed to the sunlight to harden the asphaltum. It is then again washed over with water mixed with alcohol. After the back of the plate has been covered with acid resist varnish, it can be etched to the required depth, and after it has been cleaned off with benzol is ready to take impressions from. The plate is now filled in with acid resist printing ink, the surface scraped off with a sharp knife blade, and an impression taken on a two roller press, on tissue paper. The impression is then transferred to the article to be etched and rubbed on from the back. The impression is moistened and pressed on with a soft rag, after which the paper is taken off and the design will appear on the article which now, after coating the parts which are to be protected against the acid and dried thoroughly, is ready to be etched. In this manner many articles of manufacture can be decorated with the most elaborate designs on nearly all kinds of metals.

*Practical etcher, Bridgeport, Conn.

PICKLING ALUMINUM.

In order to free aluminum articles from fat, oxide and other foreign substances, and to give them a good surface, the German Aluminum Industry Company uses a hot ten per cent. solution of cooking soda, saturated with common salt. The articles to be cleaned are dipped therein and held there 15 to 20 seconds, then taken out, and brushed; next dipped again in the pickle, and kept there half a minute. They are then well washed with water—preferably in running water—and finally dried in sawdust. This gives them a color like matted silver. If only a good polished surface is desired, it is sufficient to dip them in a dilute solution of caustic potash; after which, they must be well rinsed and thoroughly dried.

ELECTRICAL EQUIPMENT FOR THREE PHASE MOTOR CIRCUITS.

APPLICATION OF ELECTRICAL POWER IN ROLLING MILLS.

BY GEORGE R. TERRY.

Assuming that the mains in a mill are all run open through roof trusses or under floor beams, the installation of induction motors in the following manner will prove the least liable to damage from external causes or interruption from internal wiring defects and also the most durable and inexpensive to maintain, though not the cheapest in first cost.

In Fig. 1 is shown a sheet steel cut-out box containing the fuse clips mounted on a slate base. The cover of the box is hinged at the top, rendering it self-closing, and the small spring clip at the bottom holds the cover securely closed except against a direct pull. It is simple and cheap. Locks should never be used unless the box must be placed in a position inviting inspection by the uninitiated. The top of the box is drilled and bushed with porcelain bushings to pass in the taps from the line and the bottom is drilled for the conduit containing the motor circuit. The sizes of these holes should be specified when ordering by stating what size and kind of wire the three top holes are to take and also the size and kind of conduit for which the bottom hole is designed.

The box must be mounted by means of bolts or screws, depending of course on the building construction as near as possible to the main from which the motor is to take energy, either above, below or at any side thereof, and always right side up. Fig. 1 illustrates a method of mounting on a laced bottom chord of a steel roof girder. It also shows a method of supporting the conduit by means of straps made up in the blacksmith shop, as indicated in Fig. 3. The pipe saddles should be made to fit the pipe snugly and the ends long enough to each extend about one inch beyond the edge of the truss member's flanges, and as the pipe is put up this extending inch is hammered over the flanges with a few blows of the hammer, making a very secure support.

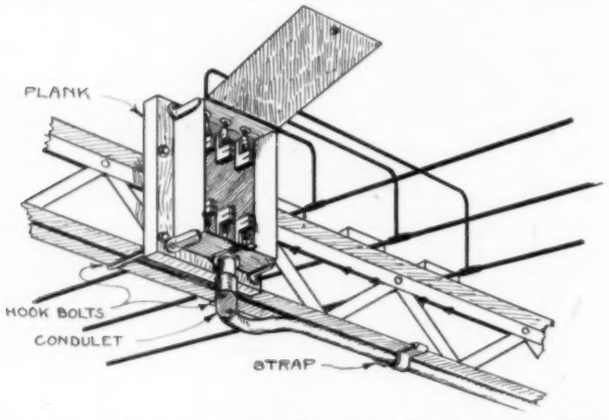


FIG. 1. METHOD OF MOUNTING CUT-OUT BOX ON STEEL ROOF GIRDER.

In the case of large cables the neatest and best way to make the connection to the mains is to use an approved mechanical connector, which permits of rapid and neat work, the removal of a very small part of the cable insulation, and gives also a perfect connection. On smaller wires a soldered connection may be used. In all cases of soldered connections, whether on large or small work, a blow-torch should never be used. The solder should always be poured by means of two ladles back and forth over the joint until it penetrates all through the stranding and runs away freely. Then the drops should be wiped from the bottom and it should be taped while hot with two thicknesses of rubber and enough friction tape to make the total applied insulation as thick as that on the wire. Lugs should be soldered to cables by pouring the solder over the cable end until it is thoroughly tinned and then pouring solder into the lug until it is also tinned and hot enough to hold the solder molten, then it should be filled about half full, the cable end pressed quickly into place and held rigidly until set. A blow-torch should never be used on any wiring work.

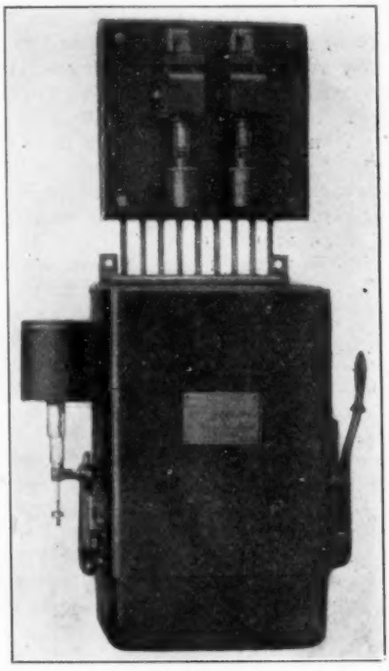


FIG. 2. COMPENSATOR WITH OVERLOAD AND NO-VOLTAGE RELEASE COILS.

The conduit should be run from the cut-out box to the motor-starting switch, or compensator, and then to the motor. When the end of the conduit faces downward simply a bushing should be used and when the end faces upward a condulet or similar outlet fitting is best. From cut-out to compensator, and from compensator to motor, the conduit should be run with bends and offsets to fit conditions, but such fittings as condulets should not be used to make turns. Wire cannot be pulled through them; they break the continuity of the run and weaken the construction generally. The outlets at compensator and motor should be as near the terminals to be connected to as possible, and when conditions permit these connections should be back of the apparatus in order that they may be protected from interference and that they do not look unsightly. It is important that all conduit be very securely supported, especially at the ends. Condulets may be used at each outlet, but where the outlet faces down and the wires are not subject to interference an ordinary bushing is preferable.

The compensator illustrated in Fig. 2 is one which, in place of fuses, has overload and no-voltage release coils and all connections can be made directly back of the overload coils just above the compensator case. Where fuses are used instead of the overload coils they should

be in an iron box similar to that used at the motor circuit connection to the main. The fuses at the latter point should be of a size to protect the motor circuit conductors and at the former the size should be such as to protect the motor against too great an overload. The size of the conductors from main to motor should be sufficient to carry four times the full load current of the motor and the size of conduit such as to allow the wires to be drawn in with ease. The table in Fig. 4 is one compiled and used for laying out this class of work.

In laying out an induction motor circuit it must be remembered that when starting the motor takes about four times its rated full load current and the conductors should be selected accordingly. Then the fuses at the cut-out must be selected to adequately protect the conductors in accordance with the rules of the fire underwriters. At the compensator the fuses are of such size, or the overload relay so set, as to protect the motor from excessive currents when operating. If they open the circuit when the current reaches one and one-half times the rated load current of the motor they will be set about right, but the nature of the work the motor is doing may necessitate other adjustments. For this reason the overload relays above mentioned are to be preferred to fuses, especially as fuses need replacing after operating, while the overload relay is automatic, the motor being in a position to start instantly without further thought or attention after an automatic stopping thereof due to overloads. The relays may be set to operate at, for example, 150 per cent. of rated motor load, and by adjustment of the dashpot attached to the tripping mechanism they will operate instantly or after a delay of a few seconds, which delay is in proportion to the amount of overload, a sud-

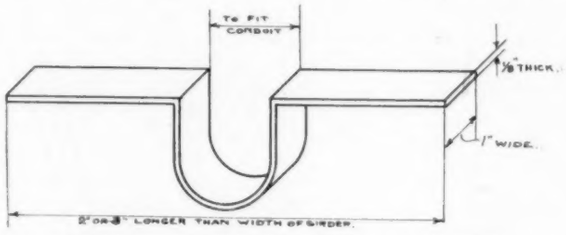


FIG. 3. STRAP FOR SUPPORTING CONDUITS.

den excessive overload tripping the switch instantly while smaller momentary overloads of short duration will not trip the switch, though one of the same magnitude continued for some seconds would do so. Also if the power supply fails the switch immediately opens, cutting the motor off the line until it is restarted.

SIZE OF CONDUIT FOR THREE CONDUCTOR CIRCUITS.

(No. 10 wire and larger Stranded.)

½"	conduit	for	No.	14	B. & S.	wire.
¾"	"	"	"	12	"	"
¾"	"	"	"	10	"	"
1"	"	"	"	8	"	"
1"	"	"	"	6	"	"
1¼"	"	"	"	4	"	"
1½"	"	"	"	2	"	"
2"	"	"	"	0	"	"
2"	"	"	"	00	"	"
2"	"	"	"	000	"	"
2½"	"	"	"	0000	"	"
3"	"	"	"	300,000	cm.	cable.
3"	"	"	"	400,000	"	"
3½"	"	"	"	500,000	"	"
3½"	"	"	"	600,000	"	"
4"	"	"	"	700,000	"	"
4"	"	"	"	800,000	"	"

FIG. 4.

This equipment is practically a standard in some present-day mills and is remarkably efficient, having cut down delays due to interference with open wiring on the walls or about machines and to waiting for the electrician to replace fuses, which often amounts to many hours in the aggregate on certain machines. In some instances single-wire drawing blocks driven by individual motors have blown enough fuses and remained idle while the electrician was sent for to replace them long enough to almost pay for a new motor once a year. With the above style of compensators every time anything jambs, or misuse by the operator throws an excessive load on the motor, the switch trips and the operator has only to start the motor again. Also when it is demonstrated that the operation of the motor protective device means mere inconvenience to the operator instead of a period of waiting, the number of interruptions to the continuous operation of the motor decrease remarkably.

SMOKE PREVENTION IN ENGLAND.

FROM UNITED STATES CONSUL CHARLES N. DANIELS, SHEFFIELD.

A smoke consumer and fuel economizer, the invention of a Rotherham man, was successfully demonstrated in that city in the latter part of October in the presence of a number of members and officials of the Rotherham corporation. The inventor has been at work on the problem of smoke prevention for twenty years and claims to have arrived at its solution.

Coal was fed into the furnace of a boiler generating steam for running the works, with the usual result, the emission of black smoke from the chimney; then the "consumer" was put into operation and the effect was at once apparent. In the place of the black defilement there was only a slight trace of the products of combustion.

The change is effected by an arrangement of a series of devices so placed in the flues as to intercept the smoke and cause it to be ignited by the flames of the fire. Two air circulators are so placed as to allow the desired quantity of external air to be circulated among these devices, causing the smoke to be properly ignited and consumed around the boiler flues before entering the chimney.

There is nothing to get out of order and the claim is that a saving of fuel is effected. An important claim is that the apparatus can be affixed during a week end to almost any type of boiler. As to fuel economy, the experiments are not yet completed.

NON-MAGNETIC YACHT, THE CARNEGIE, AT WORK.

Recent reports have been received that the non-magnetic yacht Carnegie had reached Buenos Ayres. That yacht, which was described in THE METAL INDUSTRY January, 1908, is the first one ever built with bronze substituted for iron; the latter deflects the magnetic needle and bronze does not. The result is that all former observations are inaccurate.

The Carnegie found two grave errors in the British Admiralty charts in her voyage to Great Britain, and returning via the Azores she found that the captain was not to blame who ran a great steamer upon the rocks, which destroyed it. On the contrary, he was sailing in the right course according to his chart, but the institution yacht proved that the chart was from two to three degrees astray. The Carnegie is going over all the seas, year after year, setting the world right.

POLISHING WHEELS, THEIR CONSTRUCTION, USE, CARE AND ABUSE.

By T. C. Eichstaedt.*

T. C. EICHSTAEDT.

Much can be said and much has been said about polishing wheels, but I have never seen an article treating on polishing wheels by one who has had practical experience with them. While I have had twenty-seven years' experience at the polishing trade, I feel that there is still much about these wheels that I do not know. I will, however, endeavor to tell some of the things that I do know from practical use of them, and will take the wheels in the order that I have become acquainted with them. The first and probably the oldest wheel in the market is the wooden wheel, covered with leather. This wheel, when made correctly, is made up of thin white pine, seasoned lumber, glued together in a press. Cross grain each piece to prevent the wheel from splitting. An iron bushing with a flange on one end of it is bolted through and has a flange on the other side into which the bolts are screwed. They are generally not made this way, but only have one flange, and this is a part of the bushing and wooden screws are used to fasten this to the wheel. The screws become loose and soon the bushing is loose and the wheel gets out of true and is dangerous to work on. Therefore it is better to use two flanges and bolts than only one flange and wooden screws.

These wheels can be made of any size desired, but for ordinary use a sixteen-inch wheel, three and one-half inches wide with a one and one-quarter inch hole, is about right to run at a speed of 1,700 to 1,900 revolutions per minute. But for special work they can be made of any desired width or diameter. I have used them from six inches in diameter to twenty-two inches, and have seen some that were thirty-six inches in diameter with a six-inch face. These were used on sad iron bottom and sides, a special machine being made on which to run these wheels. The wood having been glue pressed, dried and bushed is then put into a turning lathe and turned down to size. After this is done they are then covered with leather, which should be of the best quality, selected from the back part of the hide, and oak tanned. The leather is given a soaking and then stretched and scraped (the hair side) and dried. Then it is put onto the surface of the wheel (hair side down) with hot glue by means of a stretcher and tacked down with square headed nails just to hold the leather in place until the glue has dried thoroughly, when the nails are pulled out and wooden pegs substituted. The wheels are then put into a lathe again and turned down to an even surface, oiled with Neat's foot oil, and the surface sandpapered off. The wood part of the wheels is given a couple of coats of shellac to make them waterproof. The wheels are now ready for the polisher.

The first thing the polisher should do to one of these wheels, is to balance it. Put it on the polishing machine and see that it runs true. Then sandpaper it off and size it up with glue water and let it dry. Now it should be set up in the size emery wanted by applying glue to the surface of the leather and rolling it in a tray of emery. The most important thing in putting this glue and emery on is to have the glue of the right kind and thickness and apply it hot and roll it quick and with a pressure. Some people have an idea that it must be pounded, but it does not need pounding. It should be rolled with one's weight on the wheel, using a piece of pipe or stick through the hole. Another important factor in the use of these wheels is to see that the hole fits the spindle or that the wheel is in perfect balance before putting it on the machine, and these are important points to bear in mind with all polishing wheels.

After the wheels are set up in the different grades of emery desired, they are dried. This drying process is also important. Some polishing rooms have ovens to dry wheels in. These are bad unless they are so arranged that they are open above and below to admit a circulation of air and are not kept too hot. If too hot the wood in the wheels becomes cracked, which will cause the wheel to get out of round, and again, if the glue dries too quickly, it loses its hold, and the emery flies off the wheel when used. I have seen so many dry rooms or ovens, that I have come to believe that the best way to dry wheels is to have a sort of box near the glue pots and emery boxes, put a couple of return pipe bends on the floor underneath it and have no bottom or top on the box, have a few shelves made of slats or, better still, pipe or rod to lay the wheels down flat or so that they will have a circulation of dry air all around them. This can be done with no extra expense for steam, as the coil can be on the same pipe that runs the glue pots. Have the coil ahead of the glue pot valve, and then there will be no danger of having too much heat as the glue only needs a very little steam after it once gets cooking. This will be O. K. where there are only a few polishers employed, but if there are a number of polishers there should be a wheel room provided for the wheels and a man put in charge of it to keep all the wheels set up and the glue in the proper state. This is the most economical way. A good wheel man can save a concern many dollars. Of course the polishers would rather take care of their own wheels.

These wooden wheels covered with leather are the best wheels for polishing any work that needs to be kept straight with square corners and edges. Straight round pieces may also be polished to advantage on them. I will here mention a number of articles that can be done most economically and satisfactorily finished on this wheel: builder's hardware, butts, hinges, door-plates, push and kick plates, escutcheons, latches, bolts, keys, cylinders, lockfronts, cupboard catches, sewing machine slides, fan plates, medallions, shuttles, all flat parts to adding machines, shears, pistols, rifles, guns, cutlery, etc.

The life of one of these wheels with proper treatment is from ten to twenty years. I shall now explain their care and use. The wheel must run true or it should not be used, for it will be ruined. A wheel used for a roughing-out operation is generally used dry except on yellow brass or aluminum when tallow should be applied while the wheel is in motion, but on

* Expert metal polisher and finisher.

iron or steel it should be used dry. The wheel should be watched closely to see that the emery does not wear through and the leather become exposed, for if it does, the wheel should be taken off the machine at once and put on the rollers to wash all the emery off. The emery should never be buffed or knocked off, but always washed off, for buff sticks or carborundum bricks will only spoil the wheel. No matter how carefully they are used they will get hot and heat the wheel so that the leather will become loose, and after this once occurs, the only way to remedy it properly is to take it all off and turn down the face of the wheel and recover it.

I have seen them patched and patched with no good results. They will work for a while but never like they did before coming loose. The spot that was loose will always bother. So a place must be provided to wash them off and it is also important that they should be taken off the rollers when washed off so as not to get the leather water-soaked. The water should not be hot but only luke warm as hot water is liable to loosen the leather. The wheel when washed should be put on a polishing machine and allowed to run until perfectly dry and then sandpapered off lightly so as to make the surface clean for the glue to be applied, then apply the glue and roll in emery. The leather on these wheels should be oiled with Neat's foot oil whenever they need it and this is quite often.

I have seen these wheels made with grooves for polishing sewing machine hand wheels, but it does not pay. I have also seen them grooved for screw heads, but there are other wheels which are better adapted for that kind of work. I have also seen beveled wheels made of wood, with leather covers, but there is no saving in them either, as there are wheels made of other materials which I expect to speak about later that will be more economical for this work. When the wheels are used dry for roughing they need not be washed off until they become uneven on the surface or they break out, but an oil or grease wheel must be cleaned off when become worn out or when it needs a fresh coat of emery. Where one has not the facilities for washing off these wheels on rollers they can be washed off on the machine in the following manner, which, while it is not as good a way, it is better than using a piece of emery stone or buff stick; Have a vessel of hot water, just hot enough so that you can bear your hands in it, and set it on the floor or on a stool under the front of the wheel and have a piece of waste and a piece of brick or pumice stone. Soak the waste with water and apply it to the surface of the wheel while it is in motion, having the pail or vessel containing the water directly under the front of the wheel, so that all the superfluous water will drip into the vessel. After applying the wet waste a couple of times, apply it again and again with the brick or pumice directly under it, the waste in one hand and the brick or pumice in the other, and so continue until all the emery and glue are washed off and you have a clean surface of leather. Let the wheel run while you clean up the mess, and then use a piece of sand paper on the surface of the wheel, and it is ready for another coat of glue and emery again.

BUSINESS OUTLOOK IN CANADA.

A Brief Report of Canada's Mineral Production.

The King's speech, delivered at Ottawa in November, on the occasion of the opening of Parliament, contained congratulations on "the ever-growing prosperity of this favored land." The document dealt with trade and commerce in general, and embraced reference to "the growth of our industries." The rapid expansion of the iron and steel trade in all its branches was not lost sight of. The metal industries were reviewed at some length.

CANADA'S SILVER OUTPUT.

Since 1866, according to official statistics, the silver output of Canadian mines has increased by 6,769 per cent., and Canada is now in third place on the list of the world's silver-producing countries.

Figures relating to the production of lead indicate an advance even greater, the net gain approximating 21.156 per cent. Aggregate figures of the country's mineral output for the past twenty-five years exhibit an increase of 784 per cent. In 1886, the total value of mineral products was estimated at $10,221,000, which compares with $90,415,000 last year.

Some of the more important details were as follows:

	1909.	1886.
Copper	$7,018,000	$385,000
Gold	9,790,000	1,365,000
Lead	1,959,000	*9,216
Nickel	9,461,000	†498,286
Pig Iron	2,223,000	‡583,158
Silver	14,358,000	209,000

*1887. †1888. ‡1900.

PIECES COINED AT THE MINT.

It is less than three years since a branch of the Royal Mint was founded at Ottawa, and during that time 44,316 pieces of gold, 18,703,085 pieces of silver and 9,320,472 bronze coins, representing an aggregate value of $2,769,332, have been made. Some of the raw material was purchased in the United States, but a large percentage was the product of Canadian mines.

SURVEYING THE PROVINCES.

A brief survey of the mining developments of each province prominent in the Canadian history of metal mines will be of interest. In the realms of silver leads Ontario, with a total approximate production valued at over ten million dollars, and an aggregate output of gold, silver, copper, nickel, pig-iron, etc., as per figures compiled by the Deputy Minister of Mines, Mr. Thos. W. Gibson, valued at twenty-five millions, in round figures.

Treated at reduction works located in Thorold, Copper Cliff, Trent Mills and Deloro, were 7,069 tons of ore, containing 50 per cent. of the total silver yield of the Cobalt camp. The entire production of that region for nine months, just ended, amounted to 468,887 ounces of metallic silver, while for the whole province, embracing Cobalt, Gowganda, Elk Lake, South Lorraine and the Lake Superior districts, the output for the nine months was estimated at a little less than twenty million ounces, valued at $9,792,669.

Particulars of all minerals produced in the same period and province were as follows:

Silver	$9,792,669
Gold	28,729
Cobalt	44,884
Copper	1,022,436
Nickel	2,989,651
Pig iron	5,039,626
Zinc ore	5,760

The returns relating to the production of nickel at the Sudbury mines in 1910 showed an increase of 56 per cent. over 1909. The output was figured at 13,905 tons. The copper output, amounting to 7,168 tons, exhibited an increase equal to 28 per cent.

NOVA SCOTIA'S PLEASING EXPANSION.

The past year has been characterized by pleasing expansion and steady progress in Nova Scotia, where coal mining plays a prominent role. The output of pig iron and steel was of record proportions, and while the gold mines of the province were actually worked, the output showed a slight decline, when compared with figures for 1909.

NEW BRUNSWICK AND QUEBEC.

As to New Brunswick, the mineral possibilities of that province include copper, nickel and manganese, but there are complaints of apathy on the part of the Government.

The Province of Quebec is most wealthy in copper, of the non-ferrous metals, and this mineral has been moderately active, with brighter prospects for 1911.

ON THE PACIFIC COAST.

Diverting attention to British Columbia, several thousand miles distant, it is observed that the mineral output generally for 1910 shows a gain over the preceding year, but copper, lead and zinc particularly, show a slight decline. Gold and silver figures prominently in the list of metals mined in this province, and these scored increases over last year. The Yukon Territory has ended a year similarly prosperous.

NICKEL PLATING.

A History of this Valuable Industry and Some Instructions in Plating Operations.

By Percy S. Brown.*

(Concluded from January.)

NORMAL REACTIONS OF NICKEL SOLUTIONS.

Nickel solutions made as described in this article are acid in reaction when first made up and should always be so.

TESTING REACTION OF SOLUTIONS.

If red litmus paper turns blue in the solution it is an indication of free alkali, if blue litmus turns red it indicates free acid. Litmus, however, does not distinguish between acidity due to the boric acid and that due to free sulphuric acid, and for this reason it is always advisable to use red congo paper in conjunction with the litmus. In the presence of free sulphuric acid the congo paper turns blue.

This does not take into consideration the nickel fluosilicate nor the other less well known solutions mentioned in this paper, but refers to the solutions made from nickel sulphate and nickel ammonium sulphate. The same applies to all other remarks under the various headings of tests, causes of acidity, etc., as special solutions have qualities which necessitate separate study and this study does not come in the scope of this article.

CAUSES OF ALKALINE REACTIONS IN NICKEL SOLUTIONS.

In the nickel sulphate solution alkalinity can only be caused through alkalies introduced into the solution from some outside source such as the cleaning solutions. This also is true of the nickel ammonium sulphate solution although their is another possible cause in this case, namely—decomposition of the ammonium sulphate and the formation of ammonium hydrate. Alkaline reaction due to the latter cause is or should be rare as it can usually be attributed to the fault of having too much nickel salts in the solution.

CAUSES OF ACID REACTIONS IN NICKEL SOLUTIONS.

Acid reaction other than that formed by the boric acid is due to the formation of free sulphuric acid. The free acid is formed when the nickel content in the solution becomes too low.

EFFECTS OF FREE ACID OR ALKALI IN THE SOLUTION.

Free acid tends to whiten the deposit but makes it hard and liable to peel. Free alkali causes the deposits to be discolored, dark in color or spongy.

NEUTRALIZING AN ACID BATH.

To neutralize the bath and add nickel salts at the same time is desirable and it is therefore advisable to add nickel carbonate a little at a time until all acid is neutralized. The effect is explained by the following equation:—

$$H_2SO_4+NiCO_3=NiSO_4+H_2O+CO_2$$

As shown by the equation nickel sulphate is formed together with water and carbon dioxide, the latter passing off as a gas. By using this method no inert salts are added to the solution.

NEUTRALIZING AN ALKALINE BATH.

The best medium to use is sulphuric acid as this will convert any free alkali into a sulphate.

Assuming that the alkaline reaction is caused by free ammonia the following reaction would take place:—

$$2\ NH_4OH+H_2SO_4=(NH_4)_2SO_4+2H_2O$$

By this reaction ammonium sulphate and water are formed and as this form of alkalinity develops only in the nickel ammonium sulphate solution the formation of ammonium sulphate is not an objectionable feature.

If the alkalinity is due to the cleaning solutions, either the caustic potash or potassium cyanide, the following equations take place.

$$2KOH+H_2SO_4=K_2SO_4+2H_2O$$

or

$$2KCN+H_2SO_4=K_2SO_4+2HCN$$

In the first equation potassium sulphate and water are formed and in the second potassium sulphate and hydrocyanic acid. The small percentage of the latter that is likely to be found will not be a cause of trouble.

GENERAL RULES FOR CORRECTING FAULTS IN NICKEL SOLUTIONS.

(1) The cathode receives no deposit or is discolored.
Cause—Too weak a current density.
Remedy—Increase the current density.

(2) The deposit has a yellowish tinge.
Cause—Alkaline bath.
High percentage of iron deposited with the nickel.
Remedy—Neutralize the alkali.
Filter solution and replenish with nickel salts.

(3) Deposit has good color at first but turns gray or the edges turn black.
Cause—Too great current density.
Remedy—Reduce the current density.

*Electro-chemist Western Electric Company, Hawthorne, Ill.

(4) The deposit is dark, mottled or spotted.
Cause—Alkaline bath.
Too concentrated (shown by hydrometer).
Not enough nickel salts (shown by color).
Conductivity is poor.
Remedy—Neutralize.
Dilute with water.
Dilute with water and add nickel salts.
Add conducting salts (common salt).

(5) Deposit peels.
Cause—Too strong current density.
Bath too acid.
Work not clean.
Remedy—Reduce the current density.
Neutralize the acid.
Be sure that all work is thoroughly clean and well rinsed before placing in the solution.

(6) Deposit is pitted.
Cause—Small particles of dirt in the solution.
Free hydrogen due to too high current density or too little metal in the solution.
Remedy—Filter the solution.
Reduce the current density or increase the metal content by adding nickel sulphate.
The best remedy for pitting is to agitate the bath, preferably with air. When this form of agitation is used it is absolutely essential that the solution be filtered at regular intervals.

(7) Deposit forms on part nearest the anode but not in the recesses.
Cause—Work is too near the anode.
Solution does not have high conductivity.
Remedy—Increase distance from anode to cathode.
Add conducting salts.

(8) Deposit is gray but appears satisfactory and takes good polish.
Cause—Due to forced conditions such as very high current density in hot or agitated solution.
Remedy—Do not force the deposit.
Close inspection will sometimes fail to indicate this condition and ordinarily it will not be known until the articles have been placed in service.

CONCLUSIONS.

As a general rule the best way to control a nickel solution is by exercising common sense and no rule of thumb can be employed. It is also true that no set of rules can be drawn up to cover every condition, as local conditions must necessarily be given consideration. The above remarks and general suggestions are made with a view to aiding the plater to use his judgment, but he should not consider them infallible nor use them other than as a guide. There are not doubt many platers who will take exception to some of the author's remarks, and criticism will be welcomed. If all of the author's statements were absolutely correct, and he is assuming that such is the case else the article would not be written, he would indeed be gratified. The article is the result of experiments in a practical way, combined with the reading of books and papers which are more or less authoritative, and credit is due to Dr. Edward F. Kern and to Langbein's valuable book for much of the information herein embodied.

NEW METHOD OF METAL COATING

FROM UNITED STATES CONSUL GENERAL FRANK H. MASON, PARIS, IN CONTINUATION OF REPORT OF UNITED STATES CONSUL GENERAL MANSFIELD, ZURICH, IN THE METAL INDUSTRY, JANUARY, 1911.

The principle involved in the new method of coating various substances with metals, which process is the invention of a Swiss engineer and was recently presented before the Academy of Sciences at Paris by a member of the institute, consists in reducing molten tin, zinc, copper, lead, aluminum, or other metal or alloy to a state of pulverization by the pressure of an inert gas—nitrogen or hydrogen—and in that state driving it against the surface to be covered from a flexible tube with a tip like that of a large vaporizer for liquids.

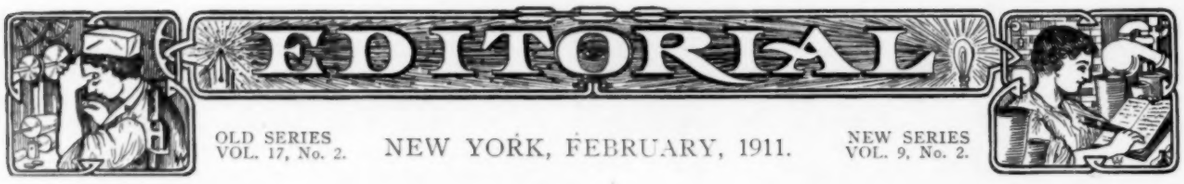
DESCRIPTION OF APPARATUS.

The apparatus is simple in construction and consists of a closed crucible, in which the covering metal is fused, with an orifice at the bottom which can be opened by a stop valve worked from the outside. At the side of the apparatus stands the steel cylinder in which is supplied the condensed nitrogen or hydrogen gas, under high pressure, as such gases are used in various industrial processes. From this cylinder a tube leads through a small furnace heated by gas flames. The portion of the tube within the furnace is made spiral like the worm of a still, so as to multiply the heating surface, and the gas passing through it is raised to a temperature of 200 degs. Fahr., or more. Beyond the furnace the tube divides into two branches, one of which opens into the closed crucible containing the molten metal and exerts upon the molten surface the expansive pressure of the supply cylinder, augmented by heating as the gas passes through the spiral tube.

The other branch of the pipe passes downward and terminates in a tip with a pointed orifice, so shaped as to promote spraying, as in an ordinary vaporizer. From the lower apex of the crucible another tube leads downward, terminating in a conical bulb, the point of which is pierced with an orifice and so held that the molten metal expelled through the orifice by gravity, aided by the pressure in the crucible, meets the stream of hot nitrogen or hydrogen gas ejected under high pressure from the first branch of the tube, as above described.

CHARACTER OF METALLIC DEPOSIT.

The result of the mingling of the two jets of inert gas and molten metal under these conditions is to atomize or convert the latter into a cloud of metallic vapor, which, being projected against a surface of iron, steel, wood, or almost any other substances, forms upon it a metallic coating similar to the deposit of copper on an electrotype plate by the galvanic process, the difference being that by the new process, the method of coating with metal is mechanical and immediate, and not dependent upon chemical action.



OLD SERIES VOL. 17, No. 2. NEW YORK, FEBRUARY, 1911. NEW SERIES VOL. 9, No. 2.

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THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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BRONZE CASTINGS

The foundry has for a long time been pretty well neglected by engineers and metallurgists, although the brass foundry seems to have come in for the greater share of the attention of the reformers. This may be due to the fact that brasses and bronzes are comparatively simple alloys, which lend themselves readily to experiments upon a small scale, whereas cast iron, even though it contains 94 per cent. of one constituent, viz.: pure iron, is a most complex alloy, containing in addition to iron, silicon and carbon in two forms, manganese, sulphur and phosphorous, and occasionally other elements. There is still much to be learned concerning the brass foundry, however, and it is mainly for this reason that we welcome the valuable paper recently added to the transactions of the Institution of Mechanical Engineers by Prof. H. C. H. Carpenter and C. A. Edwards. The authors set out to investigate the production of castings of non-ferrous alloys capable of withstanding high pressures, whether hydraulic, steam or gaseous.

In order to comply with certain conditions which the authors regarded as essential to the production of sound brass castings, and to which we will refer later, they chose the casting of a cylinder in a chill mold.

The authors described the process of casting through its various stages, and noted the difficulties encountered. First, there is the formation of a scum or dross melting. As is well known, this can be reduced by melting under charcoal, and can be partially removed by skimming before pouring. Molten metal dissolves gas, the amount increasing with the time taken in melting, and the temperature attained. Thus in the course of the experiments undertaken by Prof. Carpenter and Mr. Edwards, it was found that pouring at a high temperature, by increasing the amount of gas to be liberated when the metal solidified, made the castings more spongy than when cast at a lower temperature. The importance of this in the case of steam and hydraulic pressure is obvious, as porosity is fatal.

But it must also be pointed out that metal cast at a high temperature was both stronger and more ductile than when cast at temperatures about 200 deg. Fahr., above the solidifying point. Although every precaution may be taken to recover dross before pouring, yet some dross always finds its way into the mold, and must be removed before solidification, if sound castings are to result. As is well known, a riser or head is often used for this purpose, but an experience narrated by the authors illustrates the fact that the riser is not necessarily a complete cure. In casting an aluminum bronze, great trouble was experienced from dirty castings. Several fluxes were tried

with little or no success. Finally, the authors were led to the conclusion that the well-known tendency for a skin of alumina or aluminum oxide to form on the surface of a molten aluminum alloy was responsible, the swirling of the metal causing this skin to be imprisoned in the body of the metal, whilst fresh metal was constantly being exposed or further oxidation. Hence, it follows from the authors' experience, that a metal should be cast from the bottom, and as quietly as possible so as to avoid swirling —thus keeping the alumina skin to the surface of the casting. In practice, this theory was amply borne out, and in order to get clean castings with aluminum bronze, slow, quiet pouring from the bottom was found to yield excellent results.

The subject of aluminum bronzes is one of considerable interest, and as far back as 1891 a very extensive series of experiments were undertaken at Horwich, when, curiously enough, many of the difficulties mentioned by Prof. Carpenter and Mr. Edwards, were unsuccessfully encountered. This makes the succes of the present investigators all the more pronounced. They have succeeded in obtaining non-ferrous hydraulic castings, capable of withstanding pressures varying from 14 to 20 tons, and of holding gas pressures of 2,000 to 3,000 atmospheres at the ordinary temperature, by the use of pure copper aluminum bronzes, containing from 9 to 11 per cent. of aluminum, according to the size and shape of the casting, and permitting considerable latitude as regards the degree of "stiffness" required. The largest casting experimented upon, weighed 36 lbs. including the gate and riser. The most suitable compositions for these were the bronzes containing from 9 to 10 per cent. of aluminum, higher percentages of aluminum could be successfully employed only with small castings. It is important, however, to note the following precautions, which were found essential.

(1) The alloy must be poured slowly; (2) it must be cast at a temperature of not more than 50 deg. Cent. to 80 deg. Cent. above that, at which freezing begins; (3) the gate should be so arranged that the metal enters the mold at the lowest possible point. Broadly speaking, any form of gate will do, but it has been found advantageous to provide a sort of well at the bottom, and to use a narrow opening; (4) in the case of green sand molds, care must be taken that the sand is not too damp; and (5) in large castings the use of risers is essential to overcome the shrinkage of the alloy. The authors consider that if these conditions are observed, castings can be regularly made that will be free from dross and nearly always sound. During their experiments, the average was not less than four clean sound castings out of six, while from statistical data, furnished by the authors, the castings appeared to be perfectly satisfactory with regard to homogeneity, and their corrodibility was extremely slight, whether in fresh or sea water. The bronzes recommended by Prof. Carpenter and Mr. Edwards are certainly worthy of a trial in cases where chronic difficulties are encountered with the use of gun metals, manganese bronzes, etc. In particular, the metal must be poured as quietly as possible, and every care taken to prevent it from being agitated after it has entered the mold.

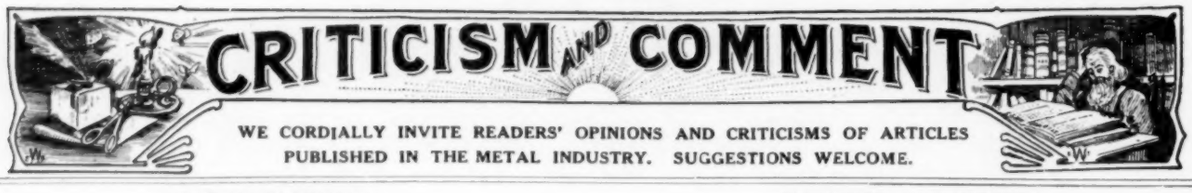
There is little to criticise in the work of Prof. Carpenter and Mr. Edwards, which we are pleased to regard as the practical seal upon the eighth report of the Alloys Research Committee. A point brought out by the authors, was the great importance in the production of good castings, and attention to small details. But we cannot understand why they commenced with a gun metal containing as much as 15 per cent. of tin. Such an alloy is very brittle and has practically no extension. On the Midland Railway, this alloy is used for slide valves, and it has been found under the test of a falling weight of 1 cwt., that the valves cast in sand cracked almost invariably with the first blow from a height of 8 ft., and were generally in half by an average of about four blows. If, however, these valves had, instead of being allowed to cool down in a sand mold, been raised above the temperature of 50 deg. Cent. and plunged into cold water, they became so tough that it would take about four blows to start a crack, and an average of about nine blows to break the valve. Another point to which we would like to draw attention is this; the research worker possesses an advantage in not being bound to specification. The commercial engineer who carries out such work for customers, like the Admiralty, has to work very rigidly to specification if he does not wish the work rejected, and it is this fact which might retard somewhat the practical application of the bronzes proposed.

CANADIAN RECIPROCITY

In our "Correspondence Department" of this number we publish the opinion of our Toronto correspondent on the attitude of Canadian manufacturers toward the proposed reciprocity arrangement with the United States. The conclusions of the correspondent are: That the tariff revision is looked upon as of benefit to the farmers, and the prosperity of the farming class will affect business in all branches with the result that a trade expansion will take place in the metal and kindred industries. While there is some opposition to reciprocity, this opposition is largely based on sentiment and the advancement of certain special interests.

For the sake of both countries it is to be hoped that the statesmen of each will consider reciprocity on the broad basis of the greatest good to the greatest number in the two lands and that the question may be finally settled with this end in view rather than to favor certain branches of industry. What will be the greatest good to the greatest number will ultimately be the greatest benefit to both countries.

Canada has in its forest, fields, mines and seas what we need and the United States with its factories and diversified products has what Canada wants and must buy from some foreign country, far or near. What is more natural than that the two great neighboring countries of North America should buy and sell from and to each other and thereby be brought into closer trade relations?


CRITICISM AND COMMENT
WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES
PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

NEW BOOKS

"PRACTICAL ALLOYING." By J. F. Buchanan. Size 6½ x 9¼; 205 pages, 41 illustrations. Penton Publishing Company, Cleveland, Ohio. For sale by The Metal Industry.

This book, which is a collection of articles previously published in trade journals, should make most valuable and interesting reading for the foundryman. The work is made up of fifteen chapters, each of which is devoted to some of the phases of alloy production; for instance, in the first three chapters twenty-five pages are taken up with the ancient and modern history and beginnings of metal refining and alloys and the properties of alloys. Following this, directions for avoiding the pitfalls which lie in the path of the alloy maker and formulas for foundry mixtures of all kinds, including white metals, solders, novelty metals, fluxes, etc., are given in a clear and concise manner. The book is profusely illustrated both in outline and half-tone, which serves to further emphasize the directions given. We should say that anyone connected with a foundry will find this a most useful book.

"MOTION STUDY." By Frank B. Gilbreth. Size 5½ x 8 inches; 116 pages; 44 illustrations, with index. Published by D. Van Nostrand Company, New York. Price $2. For sale by The Metal Industry.

The articles of which this book is composed were published by Mr. Gilbreth in a trade journal and have now been issued in book form. While the book is devoted to an exposition of motion study and its beneficial results as applied to bricklaying, the practice as described in the work naturally will apply to any operation that is performed by manual labor. The book is divided into five chapters with a ten-page introduction by R. T. Kent, editor of Industrial Engineering. The various chapters of the work are devoted to (1) Description and general outline of motion study; (2) Variables of the worker; (3) Variables of the surroundings; (4) Variables of the motion; (5) Past, present and future of motion study. We recommend the work to employers of labor and feel sure that they will find a great many valuable hints which will be of benefit to employers and operators alike.

"HEAT." By J. Gordon Ogden, Professor of Physics and Chemistry, Fifth Avenue High School, Pittsburg, Pa. Size 5 x 7 inches; 128 pages; bound in cloth; numerous illustrations. Published by Popular Mechanics Company. Price 25 cents. For sale by The Metal Industry.

This little book consists of a series of articles which, while each is complete in itself, give a comprehensible treatise on heat and its relation to metal makers. The subject matter is presented in such a way that it can be readily understood by anyone, whether an expert in the study of thermics or not. The book contains eleven chapters and treats the subject of heat with a description of its nature and directions for measuring in chapter one, to the manufacture of artificial ice and the application of heat to steam boilers and engines in chapters 10 and 11.

PUBLIC OPINION.

To the Editor of The Metal Industry:

It is gratifying to note that you make promises and keep them. The January number of The Metal Industry is better than ever. You are keeping step with the advance of time.

Charles H. Proctor,
President National Electroplaters' Association.

January 26, 1911.

NICKEL PLATING.

To the Editor of the Metal Industry:

I beg leave to offer a few words of comment on Mr. Brown's article on "Nickel Plating," appearing in the January issue. In replenishing the solution it is recommended that the single salt (nickel sulphate) should be used exclusively for the reason that the ammonium sulphate "keeps increasing in too great a proportion," if the double salt is used. How the ammonium sulphate manages to lie dormant with arms folded and eyes shut defying the law of electrolysis is a mystery the author does not explain.

Ammonium sulphate when brought into solution breaks up into its ions NH_4 and SO_4 yielding $NH_3 + H$ at the cathode, and SO_4 at the anode. The two main reactions when the double salts are used are:

At cathode. At Anode.
$NiSO_4 = Ni + SO_4$.
$(NH_4)_2\ SO_4 = 2NH_3 + H_2\ SO_4$
Forming with anode $Ni\ SO_4$

The water also forms a subsidiary reaction, yielding O at the anode and H at the cathode, the same as in the electrolysis of water alone.

It is presumed also that NH_3 under the action of the current breaks up into N and H_3, the H being set free at the cathode. Solutions that have been worked many years to which the double salt has been constantly added do not become alkaline, but always remain slightly acid, even when small quantities of liquid ammonia is added in the course of working. Adding ammonia, however, the writer considers bad practice and never uses it. Constantly replenishing with the single salts is an expensive if not altogether harmless practice. The single salt costs much more than the double, and it is cheaper to take the metal from the anode.

The nickel sulphate bath recommended by Mr. Brown is an old acquaintance of ours, in fact a sexagenarian friend introduced by Prof. Boettger in 1848. It has never been made to give good results and the writer is not aware of it being used today. Speaking of solutions the statement is made that the nickel ammonium sulphate bath is commonly used, "because it has been known the longest time." While this bath is the most practical and efficient, it is not by any means the oldest known. Considering nickel plating has been done with other electrolytes, notably the nickel chloride dissolved in ammonium, chloride solution, nickel sulphate, nickel nitrate, nickel carbonate were used before Dr. Isaac Adams introduced the nickel ammonium sulphate solution—the most practical yet discovered. Electro.

ANALYSIS OF SPELTER

To the Editor of The Metal Industry:

I am pleased to note that my article on "The Chemical Analysis of Spelter" has begun to bring forth fruit in the way which I desired, and that my invitation, expressed in your September, 1910, issue, to contribute to the discussion of the methods of spelter analysis has been accepted by one so eminently qualified to speak upon this subject as W. H. Leverett. Mr. Leverett's suggestions, which are to be found on page 35 of your January, 1911, issue, are a valuable contribution to the literature of spelter analysis. I trust that other chemists, experienced in the metallurgy of zinc and in the analysis of zinc products, will feel impelled to shed light on this subject, which hitherto has been kept somewhat in the dark. Andrew M. Fairlee.

Copperhill, Tenn., February 2, 1911.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—Please give me an alloy for bearings for bushes for motor cars. Also the standard lengths, diameter and bore that these rods or bushes are made up in, suitable for motor car builders.

A.—The alloy known as "S" Phosphor Bronze is the one used for bearings. The mixture is:

Copper	78
Tin	10
Lead	11
Phosphorus	1

As this alloy is not ductile enough to be rolled, it is cast into ingots that are rough turned when put on the market and called "Phosphor Bronze Cast and Turned Rods." The sizes run about two feet long and from 5/8 to 15/16 inches, and one to two inches and over two inches in diameter, varying by 1/16 of an inch. A higher price is charged for the smaller diameter rods.—J. L. J.

CASTING

Q.—We are sending you a sample casting which has a fine, smooth surface with a velvety appearance. It looks like a good, smooth casting which has been sand blasted. How is such a smooth, even surface, free from sand holes, small crevices, etc., produced on a brass casting?

A.—This work is evidently not done with any solution on the surface of the mold. It is done by good workmanship on the part of the molder. A fine sand should be used, such as Windsor Locks and the mold skin dried. A handful of salt added to a bucket of water to dampen the sand acts as a binder and allows you to skin dry the molds. The best quality of metal should be used (scrap metal should not be used). Would advise the following mixture:

Copper	90
Tin	7
Zinc	2
Lead	1

This mixture will make a very fine casting and if the above instructions are carefully followed in molding, the finest quality of a sand casting should be obtained.—W. J. R.

DIPPING

Q.—Will you please tell me whether there is a black dip for small iron or steel articles?

A.—There is no regular black dip for iron or steel articles the same as for brass. The American Gas Furnace Company of New York sell a retort for this purpose and furnish the formula for producing the black oxide of iron or steel articles. It is a finish similar to the Bower-Barff. Many concerns who manufacture small articles are using the method furnished by them. A gun metal finish may be obtained by tumbling the articles bright and then immersing them in molten nitrate of potash. The potash is heated to redness in an iron kettle, and the perfectly dry articles immersed in the bath by the aid of iron wire mesh baskets made up for the purpose.

Another method is to boil them in a boiling solution of phosphoric acid, to which is added a small amount of phosphate of iron. Some concerns produce a good finish by using a dead black Japan upon the articles. The surface is coated by tumbling in a regular tumbling barrel and adding sufficient Japan to cover the articles. The process coats and dries at the same time. The Essex Varnish Company, Newark, N. J., manufacture these tumbling Japans.—C. H. P.

FINISHING

Q.—Please inform me if nickel plated work requires lacquering, also what is the best method of tumbling small parts of flat steel work, such as hinges, etc., and at about what speed a tumbling barrel should be operated?

A.—Nickel plate does not require lacquering. Unlike other metals it does not oxidize materially by atmospheric influence. Small articles are best tumbled in leather scraps or macerated leather meal to which may be added a little Vienna lime. One or two hours tumbling will give a good luster. A tumbling barrel should revolve from sixty to one hundred and twenty revolutions per minute.—C. H. P.

METALLIZING

Q.—Will you kindly tell me how to metallize papier-mache? The process I am using is to shellac first and then coat with copal varnish and brass bronze powder. It plates all right in the acid copper bath, but rubs off.

A.—As an addition to the process now in use by you we would advise you instead of using gum copal to dissolve green rubber in benzole, producing a thin rubber cement. To this cement add a small quantity of turpentine and linseed oil mixed in equal proportions, to prevent the rubber cement drying too quickly; while the rubber surface is tacky rub in the best quality of copper bronze powder procurable. The surface should dry good and hard, and before putting in the acid copper should be immersed in a dilute solution of cyanide of potassium and water to remove the oxide that is liable to form on the copper powder surface. Following this immersion in a silver dip is good practice before the acid copper deposit. For this purpose dissolve ¼ oz. of nitrate of silver, ½ oz. of caustic soda and ½ oz. of cyanide of potassium in a gallon of warm water. Immerse your copper bronze surface in this solution for a couple of seconds and it will become silvered.—C. H. P.

PLATING

Q.—Kindly give me the best method of silver plating pewter and Britannia metal?

A.—Pewter, Britannia metal, etc., are usually steeped in a hot potash solution and transferred without rinsing to a "plating solution," containing a large excess of potassium cyanide, in which it is "struck," with a current dense enough to give evidence of incipient burning of the deposit. When struck, the work is scratch-brushed, and transferred to an ordinary plating solution to receive its final deposit. A beginner would no doubt find it easier to treat these metals as he would iron and zinc by first giving them a coat of copper in the cyanide bath.—K.

Q.—Please give me a formula for a silver solution that will be suitable for a small jobbing shop?

A.—For a six-gallon silver solution use the following formula:

Water	6 gals.
Silver chloride	15 ozs.
Cyanide of potassium	2¼ lbs.

Voltage one to two, amperage fifteen for each cubic foot of surface. The amperage can readily be taken care of by the use of a rheostat, providing the voltage remains permanent.

To prepare the solution, dissolve the cyanide in cold water, then add the silver chloride. After all the silver is absorbed, let the solution stand for twelve to twenty-four hours, then filter. New solutions oftentimes work erratic, to overcome which difficulty proceed as follows: Dissolve one ounce of bisulphide of carbon in six ounces of cyanide of potassium. Place this in a bottle containing about one pint of water, agitate freely, then allow to

settle for a number of hours. Afterwards pour off the clear solution, using care that the undissolved carbon remains in the bottom of the bottle. Use about one-half teaspoonful of the clear bisulphide cyanide solution in the six-gallon solution. This should give you a good solution for your purpose.—C. H. P.

Q.—Please give me a formula for black nickel, one that can stand buffing; also how to produce a blueish black nickel.

A.—A good black nickel that will stand buffing can be prepared as follows: Dissolve

Double nickel salts	6 ozs.
Sal ammoniac	4 ozs.
Sulpho cyanide of potassium	2 ozs.
Water	1 gal.

After the solution has been prepared, dissolve ¼ oz. of carbonate of copper in ½ oz. of 26 per cent. water ammonia and mix thoroughly in the solution. Use anodes of sheet brass and a current tension of three volts. Too much current produces a grayish tone. Polish the surface after black nickeling with a very soft wheel, using a good quality of coloring rouge for the purpose. Wash afterwards in benzine and dry carefully in maple sawdust and lacquer with a good heavy brush lacquer.

To produce a blueish black nickel proceed as follows: Saturate muriatic acid with arsenic with the aid of heat. At least 2 lbs. should be added to the gallon, and while warm add 4 ozs. of sulphate of nickel and 1 oz. of sulphate of copper. Allow the solution to cool before using, and it can then be increased to two gallons by the addition of more muriatic acid. Use anodes of cast nickel and a very low current to produce an even deposit.

The articles should be highly polished for a fine finish and should be carefully cleansed in the usual manner. After this the articles should be flashed in the regular nickel bath for a few minutes. This will give a good surface for black nickel. A good deposit is obtained in five minutes. A beautiful color will result and it will not be necessary to buff the surface again. Dry out carefully and lacquer in the usual manner.

The solution should be placed under a hood if possible, as the fumes are not very pleasant. As the solution increases in age the fumes do not develop, and the color will resemble a nickel bath. Care should be used to avoid too much contamination of the bath with water as this spots and dulls the deposit. To replenish the bath, saturate muriatic acid bath with arsenic as mentioned, and add to the bath; other additions are not necessary when bath is once prepared. This formula is used by many auto lamp manufacturers in preference to a regular black nickel solution.—C. H. P.

Will you kindly give me the following information: (1) What is royal copper solution and how is it prepared? (2) How can a cyanide copper solution be changed to a brass solution? (3) Formula to produce a bluish-green color on iron-plated brass goods?

A.—(1) Royal copper is a deep red color, produced by the aid of heat, forming a red oxide on the metallic surface which when polished with soft buffs, using alcohol and powdered rouge, as the coloring mediums produce a glassy enamel surface of a beautiful luster. The method of production is as follows: Potassium nitrate is heated in an iron pot until fluid. The previously polished and cleansed copper articles or articles heavily plated with copper are immersed in the molten potassium nitrate until the surface becomes coated with a dark oxide. The articles are then removed and immersed in paraffin oil, dried out in sawdust and polished as before mentioned. Some operators coat the articles with a film of lead to protect the surface of the copper from superficial oxidization that occurs in the atmosphere. This coating prevents a patchy color which sometimes occurs during the oxidization process. The lead bath is produced by dissolving one ounce of litharge or acetate of lead and four ounces of caustic soda in each gallon of water, using anodes of lead and a medium current. A minute's immersion is oftentimes sufficient the articles should be perfectly dry before immersing in the molten nitrate.

(2) To change your copper bath to a brass bath dissolve carbonate of zinc in cyanide of potassium solution, using as little water as possible; then add to your copper bath one ounce of zinc to each gallon, and this will produce the desired result. If the color is not light enough add one ounce of ammonia to each five gallons of solution. If the deposit is earthy with a slight reddish tone, dissolve a little arsenic in a concentrated solution of caustic soda and water, add one ounce to 50 to 100 gallons. Too much arsenic will produce a grayish brass.

(3) The bluish-green color was probably produced in a solution consisting of one gallon of water, 8 ounces of hyposulphite of sodium and one to two ounces of acetate of lead.—C. H. P.

SHRINKING

Q.—Will you kindly tell me how to avoid shrinkage spots in a tin-lead alloy?

A.—The shrinkage spots in the sample received are due to the metal cooling too slowly. One remedy would be to make the gate larger and pour at a lower temperature. We know of some similar troubles which have been overcome in some instances by cooling the molds at intervals. For some pieces we find aluminum molds very satisfactory, as they convey the heat away from the casting very rapidly.—J. L. J.

SOLDERING

Q.—Can you give us any information regarding the best way to tin gray iron castings so that sheet galvanized iron could be soldered to the casting to make a tight joint under water pressure of 125 pounds?

A.—Half and half solder does not adhere well to galvanized sheet iron because the zinc and lead do not alloy. You might be able to use terne coated sheet iron instead of galvanized iron, and this could then be soldered with the half and half solder, or the sheet iron might be riveted to the gray iron castings, and then the whole thing hot galvanized. A solder, composed of tin 30, lead 18, zinc 15 may be obtained from the National Lead & Oil Company in 1/16-inch by ⅜-inch ribbon form, and you might try this for soldering the tinned gray iron castings to the sheet galvanized iron.—J. L. J.

TINNING

Q.—Will you kindly give me the following information: (1) What is the best method to tin milk cans, to use a tin pot or an electric tinning solution? (2) Where can I buy pure Straits tin for anodes?

A.—We believe it would be far more satisfactory for you to tin the articles in the regular molten tin bath. Electro deposits of tin are not stisfactory, as there is considerable trouble in obtaining a heavy deposit. If you have not had any practical experience in molten tinning procure from this office "Tinning and Galvanizing," by W. T. Flanders. This is a very practical work, written by a man of practical experience. If you desire to try electro tinning, then the following formula will give you good results.

Sodium hydroxide	1 lb.
Hyposulphite of sodium	½ lb.
Chloride of tin	¼ lb.
Water	1 gal.

Straits or Chinese tin can be used for anodes. Any metal house should be able to furnish it.—C. H. P.

Q.—We have a mixture of lead and tin for dipping that appears to be getting full of grit and sand. Can you tell us how to get rid of this by some flux or any other method; also what is the best mixture to coat iron samples, as enclosed, with tin or lead?

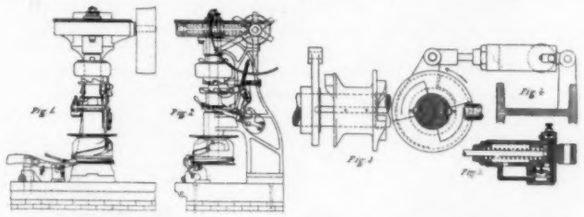
A.—When a lead-tin bath becomes contaminated with oxide and impurities it is best to put it through the sweating furnace. The liquidated metal is refined by boiling up with green hickory poles and may then be again used for dipping. The sample submitted seemed to have been first coated with tin and then with lead or with lead containing a little zinc. An analysis would determine the exact nature of the coating. A mixture of lead seven to eight and tin one is largely used for terne coating sheet iron or steel.—J. L. J.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

980,569. January 3, 1911. Wire Drawing Machine. L. C. Smith, Rome, New York, assignor to Coe Brass Manufacturing Company, Torrington, Conn.

A machine, shown in cut, designed to draw wire, in which, among other things, provision is made for starting the wire at a reduced speed from that of the block, and gradually increasing its speed until it attains the speed of the block, and a conveniently, easily and quickly manipulated means for grasping the end of the wire, and means for automatically disconnecting the block from the power and promptly stopping the rotation of the block under its own momentum when the wire breaks or terminates.

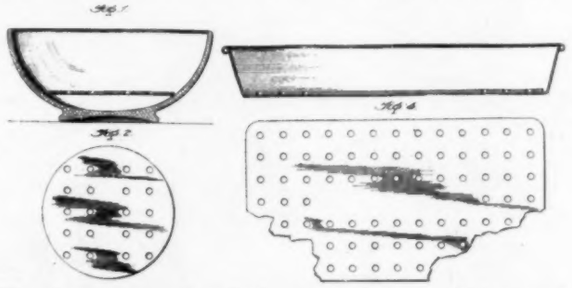


The machine is also constructed to provide for the easy and convenient removal of the wire from the draw block, and to provide a friction means in the driving mechanism, which will allow the block to slip, owing to its inertia at starting. There is also provided a die holder adapted to move from the axle line of the draw block to the periphery thereof, and follow the lines of force applied in drawing the wire.

Another feature is the mechanism for easily and conveniently stopping or starting the block by one lever, either for a regular run or for a trial pull.

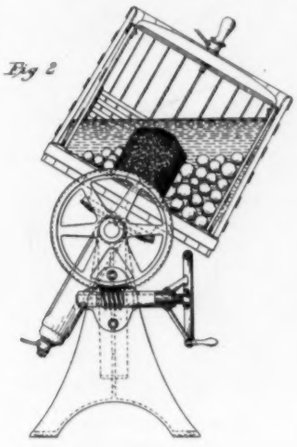
980,627. January 3, 1911. Method of Cleaning Metals. H. C. Genet, New York, assignor to Caroline Genet, New York.

An electric method and apparatus, shown in cut, for cleaning gold, silver and other metals. Any receptacle suitable to contain the liquid, articles to be cleaned and the aluminum anode may be used. It has been discovered that pure aluminum is the most efficient anode because the electrolytic action does not cause any appreciable coating or film to be deposited thereon and there is no local action on the face of said anode. Sodium hydroxid, NaOH, is most efficient to form the electrolyte on account of its action in connection with the aluminum anode and because of its strength being such that a relatively small quantity is required.



The electrolyte, sodium hydroxid, NaOH, in solution, preferably in the proportion of one half pound of sodium hydroxid to one gallon of water, the latter being preferably boiling, is introduced into the vessel, the anode introduced therein, and the articles to be cleaned are then placed in the receptacle, immersed in the electrolyte, and in direct contact with the aluminum anode. Such of the articles as do not touch the anode are in indirect connection therewith through the ones in direct contact. Preferably the solution is very hot or maintained hot or boiling. The action is as follows: Nascent hydrogen is set free and coming in contact with the oxid or tarnish on the articles to be cleaned, reduces said oxid or tarnish very rapidly, leaving the immersed articles bright without removing any metal or in any manner affecting the metal.

981,004. January 10, 1911. Electro-plating Apparatus. M. Reid, Cleveland, Ohio.

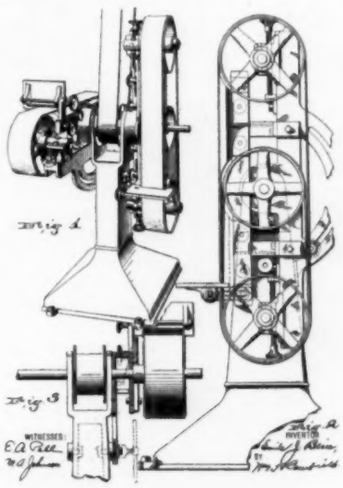


An apparatus shown in cut designed for the plating of articles and subjecting them to a tumbling operation at the same time.

The apparatus consists generally of a tank and a supporting frame. The complete tank, when ready for plating purposes, consists of an outer casing or receptacle and an inner receptacle or basket within which the articles to be plated are placed, the basket being removably fitted within the outer casing. The outer receptacle or tank has its inner surface composed of material which will not be decomposed by the electrolyte and is preferably constructed of wooden staves to which are applied hoops.

981,159. January 10, 1911. Surfacing Machine. Emile J. Bein, Newark, N. J.

This invention relates to a surfacing machine, shown in cut, and more particularly to one in which an abrasive belt is employed, usually a sandpaper belt. The machine embodies pulleys on which the belt is adapted to travel, these pulleys being mounted on the end of a beam which is adapted to rock. The machine is preferably made with a beam on each side of a standard, which standard supports the beams and also the driving shaft, the driving shaft having a pulley mounted in the center of the standard and the beams having means co-acting with the standard for holding the beams in adjusted positions.



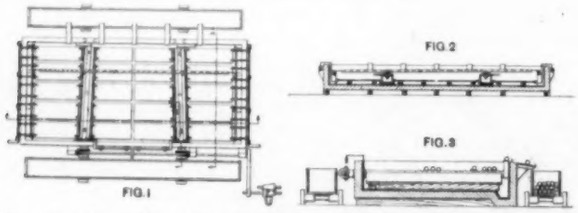
The machine is adapted for use as a horizontal or a vertical machine, or it can be used at any angle intermediate of the vertical and the horizontal, the beam being provided with a table on which the work can be held or supported when it is being ground by means of the abrasive belt. The invention also provides a driving belt which drives the abrasive belt by means of a power belt which runs over the driving pulley and also over one of the pulleys on which the belt runs, engaging the latter and also the abrasive belt, whereby all the elements work in unison.

981,196. January 10, 1911. Electro-plating Machine. Soren Sanne Jacobsen, Beaver, Pa.

An invention relating to electro-plating apparatus and more

particularly to apparatus for electro-plating long cylindrical or circular objects such as rods, tubes, etc.

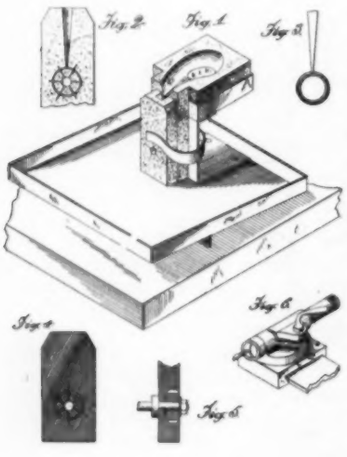
The object of the invention is to provide apparatus, shown in cut, for the purpose stated which is of simple construction, practically automatic in the feeding and delivery of the articles to be plated and whereby tubes can be plated either inside or outside, or both inside and outside. The apparatus comprises a suitable tank which may be constructed of any suitable material and which is preferably provided with a lining of suitable insulating material, such lining being preferred no matter of what material the tank may be constructed and being necessary when the tank is constructed of conducting material.



In the side walls of the tank, or in a suitable frame or support, are suitable bearings in which are journaled transversely arranged feeding screws. These screws may be driven from any suitable mechanism, the cut showing the screw shafts provided with bevel gears meshing with similar gears on a longitudinal shaft mounted in bearings secured to the side walls of the tanks and arranged to be driven from any suitable source One of the screws is right hand and the other is left hand; and the gears engage respectively on opposite sides with the gears in order to rotate the screws in opposite directions and prevent feeding the tubes or rods being coated endwise. The driving means will be arranged to secure varying speeds so as to vary the rate of travel of the articles through the tank in order to secure a coating of greater or lesser thickness. As is shown, the shaft is driven by means of a belt from suitable and reversely arranged cone pulleys or any suitable means whereby a change of speed can be secured.

981,033. January 10, 1911. Mold for Castings of Precious Metal. L. W. Severn, West Liberty, Iowa.

The object of this invention is to make it convenient to cast small objects, such as finger rings and the like, of gold or silver to produce a perfect cast without forcing the molten metal into the mold under pressure. The mold shown in the cut is made of a small slab of fine charcoal, which does not chill, but holds the heat of the molten metal and thus enables it to flow freely and fill the mold. In this is shaped a matrix for the article to be cast, a finger ring being here shown. In casting this, or any other object, it is of course desirable that the cast be clean and smooth. This is done by forming the entire matrix, except one edge, in a single block or slab. It is evident that if this be done and the flat face of the mold be closely abutted against a flat surface, the ring will cast clean and whole, with no fins and no possible offsets. Such a cast is very easily and quickly finished, and with practically no waste in filing and polishing.



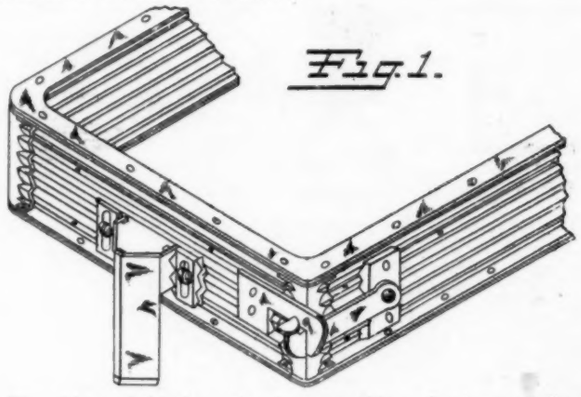
981,542. January 10, 1911. Alloy. W. B. Driver, East Orange, N. J.

The object of the invention is to produce alloys having high, and even abnormally high, specific resistances; alloys which are also reliable and permanent in their physical properties (i. e., ductile and not liable to deteriorate from rust upon exposure to atmosphere), and which are likewise reliable in their electric behavior. Although ductility is an exceedingly desirable property, yet where the alloy is to be employed in cases where it is not necessary to work it, or in other forms than drawn wire, some ductility may be sacrified in obtaining increased specific resistance.

The formulas covered by this patent run from copper 40, manganese 40, and nickel 30 parts with a specific resistance of 150 microhms per cubic centimeter to copper 75, manganese 15, nickel 10 parts with a resistance of 53 microhms. That is to say, all the intermediate variations are included within the scope of the patent.

981,723. January 17, 1911. Molder's Flask. Henry G. Voight, New Britain, Conn.

The invention relates to improvements in molders' flasks of the "cope" and "nowel" type, and more particularly to "snap flasks," so-called. These devices, shown in cut, comprise two companion upper and lower sections termed respectively the "cope" and the "nowel." With these sections top and bottom boards are used, but since these boards constitute no part of this invention, they need not be shown or described.



The object of this invention is to provide a simple, exceedingly durable and effective construction, aiming at economy of manufacture and maximum serviceability. The construction also has the advantage of lightness, strength and comparative inexpensiveness.

981,767. January 17, 1911. Babbit Material. J. L. Jones, Oakmont, Pa., assignor to Westinghouse Electric and Manufacturing Company, a corporation of Pennsylvania.

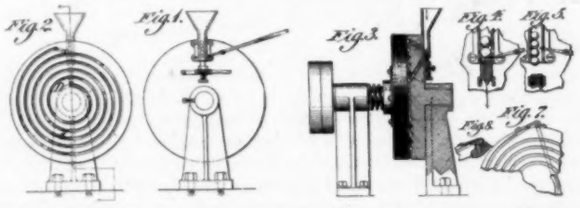
The invention relates to compositions of matter, and it has for its object to provide a Babbitt or bearing metal which shall be specially adapted for use as a lining for bearing boxes and for similar purposes.

The formula covered by this patent is as follows:

A composition of matter composed of tin, 8⅓ per cent.; antimony, 8⅛ per cent.; vanadium, between 1-100 per cent. and ½ per cent. and the remainder lead.

981,310. January 10, 1911. Machine for Grinding and Polishing Metal Balls. Albert Ringland, Philadelphia, Pa., assignor to Standard Roller Bearing Company, Philadelphia, Pa.

This is a machine, shown in cut, for the grinding and polishing of metallic balls, embodying a bed having a spiral groove or recess to receive the balls, and a runner adapted to be pressed



against said balls so as to cause the latter to traverse said recess and thereby be ground and polished, and means for returning the balls if unfinished to the bed to be furthermore subjected to grinding and polishing operations. It consists also of a tell-tale for automatically indicating that the balls are properly finished. It consists further of means for discharging the finished balls.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

WATERBURY GRINDER.

The machine shown in the illustration, Fig. 1, is known as the Waterbury grinder and has been manufactured by the Blake and Johnson Company, manufacturers of rolling and flat wire mills, hardened Krupp steel rolls, thread rolling and rivet machines, pressed and sub-presses, gang slitters, die and tool grinders, wire forming and special machinery, Waterbury, Conn., for the past twenty years.

The grinder is designed for grinding flat surfaces, such as blanking, stamping and piercing dies, punches, lathe and planer tools and all similar work that is done on the ordinary grinder. Under one wheel is a table 9¼ inches wide by 18¼ inches long, hinged at one end to a bracket and supported at the other end by a screw, furnishing a fine adjustment of 1½ inches. The bracket is counter-balanced by a weight inside the pedestal, and has a vertical adjustment of 6 inches, so that the table may be raised to within three inches of center of spindle. The other wheel is provided with an ordinary rest.

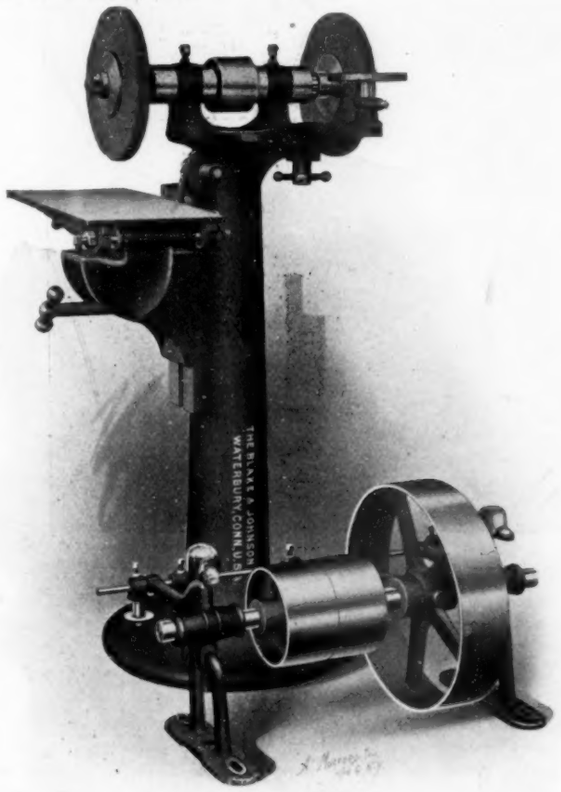


FIG. 1. THE WATERBURY GRINDER, MANUFACTURED BY BLAKE & JOHNSON COMPANY, WATERBURY, CONN.

The spindle is of steel and runs in split conical boxes of best anti-friction metal. This construction permits of easy compensation for wear and is the feature of the machine.

A cast iron water tank is attached to the pedestal near the table. A countershaft and two emery wheels, 10 inches diameter, ¾-inch face, are furnished with this machine.

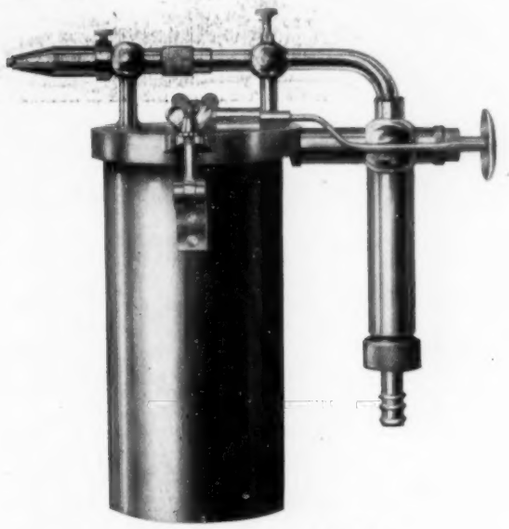
This grinder is sold for $50 complete. The only reason that the company is able to sell these well-built and properly designed machines at such a low figure is made evident by glancing at the picture shown in Fig. 2, where there are seven thousand parts shown, there being one hundred machines in the group with seventy parts to each machine. The Blake & Johnson Company will be pleased to answer any questions relating to this remarkable grinder.

FIG. 2. A GROUP OF WATERBURY GRINDERS.

THE ECLIPSE AIR BRUSH.

The air brush shown in cut has been developed by the Eclipse Air Brush and Compressor Company, Bloomfield, N. J., until they consider it a perfect, scientific, efficient machine. While it costs twice as much as some of the other machines on the market it is claimed it is well worth the cost. Some of the advantages claimed for this brush are as follows:

1.—It is operated at a pressure of only 5 to 25 pounds. All other sprayers require from 50 to 75 pounds, with the consequent waste of material, chilling of the paint, mottled appearance and large expense for power.



THE ECLIPSE AIR BRUSH.

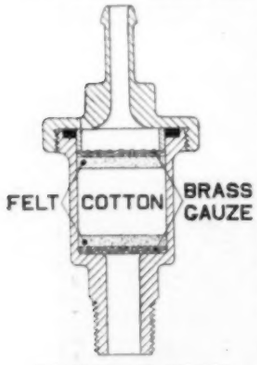
2.—The Eclipse is air-tight, and cannot spill or drip. It can be tipped or turned in any way without a drop leaking.

3.—There is no alignment of nozzles necessary as with the suction machine, and it cannot get out of adjustment.

4.—The Eclipse is easy to clean and is made of the very best material by automatic machines, and is practically indestructible. Comparison with other machines will convince one that it is a thoroughly high-class apparatus.

5.—The machine will pay for itself in one week of operation, so that the initial cost cuts no figure whatsoever.

The same concern that manufactures the Eclipse air brush has also put on the market a novel device for filtering the air that is used for spraying lacquer and other material. In this filter the air is forced through several layers of felt and cotton before it reaches the sprayer, and it is claimed that all dust and foreign matter of every kind is eliminated; also that the filter is so constructed that the air pressure at the sprayer is not appreciably reduced. This device can be applied to any air line leading from the compressor to the air brush.



ECLIPSE AIR FILTER.

Further information can be obtained by addressing the Eclipse Air Brush and Compressor Company, Bloomfield, N. J.

claimed to be valuable for the manufacture of brass bedsteads, automobile fittings, ship fittings, building hardware, railroad car fittings, chandeliers, etc. A very handsome exhibit of articles made of this metal was shown, as reproduced in the accompanying cut, at the automobile show, January 11, 1911, Madison Square Garden, New York. The twisted bar of cupror shown in the foreground in the picture was drawn out from the ingot while hot, twisted cold and the hole shown in the end was punched in while cold, showing the versatility of the metal as regards both cold and hot treatment. The wire exhibit shown in the glass tube in the picture is of great strength, though only one and seven tenths thousandths of an inch in diameter and looks like spun gold. A complete description of cupror and its virtues is given in a small folder which has been issued by the Cupror Company, 50 Church street, New York.

FOUNDRY PROGRESS.

In the application of mechanical aid, to lessen labor, and increase production in various lines of manufacture, few industries were so backward as the foundry. Until a comparatively recent date, the average foundry equipment was very crude; but notwithstanding this, some very creditable work was done, but it reflected more credit on the skill of the molder than on the facilities of the foundry to help lessen the physical exertion it was necessary for him to expend, in order to do a fair day's work. When only one or two castings of a kind were required the old way was good enough, but there have always been castings to be made for various articles which are required in very large quantities. In order to reduce the labor necessary to make the molds for this class of work, metal patterns were made and gated together, thus making the work of molding several patterns at once, no greater than molding a single pattern of the same article. Plaster matches were made, to save the time and labor it took to part the mold, but the skill of the experienced molder was still required to make good castings.

With the introduction of the molding machine, however, an inexperienced laborer could very soon learn to make castings which are more uniform and better in every way than if made on the bench or floor, and the number of molds put up each day is several times as many, as the most expert molder could put up in the old way. Progressive foundrymen quickly adopted this labor-saving device, and mechanical genius seeing a good field to work upon, set about improving it, and designing it in different forms to meet the requirements of every class of work. Each year new machines are put on the market and improve-

EXHIBIT OF THE CUPROR COMPANY AT THE AUTOMOBILE SHOW, MADISON SQUARE GARDEN, NEW YORK, N. Y.

CUPROR, A NEW ALLOY

The Cupror Company, manufacturers of cupror, the new gold-like metal, give very encouraging reports of the commercial success of this metal. As has been already described in THE METAL INDUSTRY, cupror is the newly discovered alloy of copper and aluminum and some really wonderful results are claimed to have been obtained with it. Tensile tests give remarkably high results and the tensile strength of cupror in the bar is 93,000 pounds to the square inch. In a recent test No. 20 gauge hard-drawn wire broke at 138,550 pounds to the square inch. The Cupror Company says that the essential feature of cupror is its beautiful gold-like color and luster, these being really permanent and unchanging, even though subjected to atmospheric conditions and usages of all kinds. The metal is also of extraordinary toughness and ductility, so that it can be drawn, spun and handled in every conceivable way with the greatest facility.

Great success has been obtained in the use of cupror for articles of jewelry, as, for instance, watch cases made of cupror so closely resemble goods of 18-karat gold as to have deceived expert jewelers in everything but weight. Cupror is also

ments added to old ones, and they are finding a ready sale, for the foundries using them are greatly increasing their output and lowering the price of castings without reducing their profits.

While some men are busy improving the molding machine, others are considering better and more economical methods of mounting patterns for use on the machines. At first only the simplest form of patterns were mounted, but as the success of machine molding became more and more apparent, patterns of complicated design were mounted on plates, although it was often done at an enormous expense in the pattern shop, which however, was soon made up by the saving in the foundry. By the use of a new method of mounting patterns on plates, for which patents have been granted to Hugh McPhee, of Tarrytown, N. Y., the use of the molding machine has reached its highest state of perfection. It is no longer necessary to expend a large amount of capital to prepare patterns for machine molding, for by this method they can be mounted on plates for less than it would cost to gate them for bench molding.

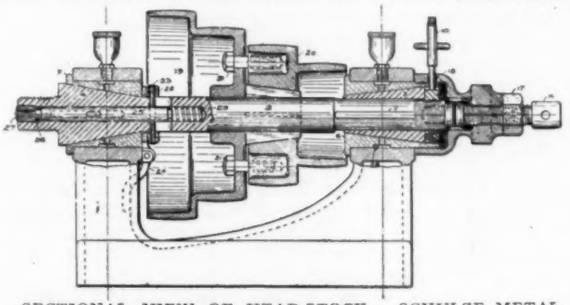
The adoption of this method by any firm having gates of patterns, at present being used on the bench, entails no extra expense for new patterns. Such gates can be quickly mounted on these plates with absolutely no pattern shop expense, as the work is all done in the foundry. Patterns which were not thought practicable or even possible to mount before, because of a lug or boss being off center, making a straight parting impossible, can be mounted on these plates as easily as patterns of the simplest design. For full information regarding this method of mounting patterns, address Hugh McPhee, 57 John street, Tarrytown, N. Y., asking for catalogue "B."

METAL SPINNING LATHE HEAD-STOCK

The spinning lathe head-stock shown in the cut is described by the maker as follows:

"The spindle (2) has two cones, the front one (4) being in one piece with the spindle and the rear one (3) a sliding fit on the reduced end of the spindle, and prevented from turning by the key (7). A nut (8) on the threaded rear end of the spindle furnishes the means for changing the location of the cone, and consequently adjusting both bearings at once. An adjusting pin (10) is supplied which is inserted through a hole in the housing (18) and by engaging a slot in nut (8) turns it without it being necessary to remove the housing for this purpose. The nut has a sawed slot and a small screw (9) which determines the tightness with which it turns upon the spindle. This adjustment, however, is made once for all and does not have to be altered when it is necessary to adjust bearing.

"To successfully withstand the end pressure a thrust bearing consisting of a hardened and ground tool steel pin bearing against a special metal disc protected on each side by similar discs of hardened and ground tool steel is provided within the housing (18). Time has proven that this thrust bearing will stand up under any kind of work. The cone pulley is made in two parts (19 and 20), the larger cone (19) having a taper hub which is sawed with four slots and fits a taper bore in the smaller cone (20). The two cones are drawn tightly together



SECTIONAL VIEW OF HEAD-STOCK, SCHULZE METAL SPINNING LATHE.

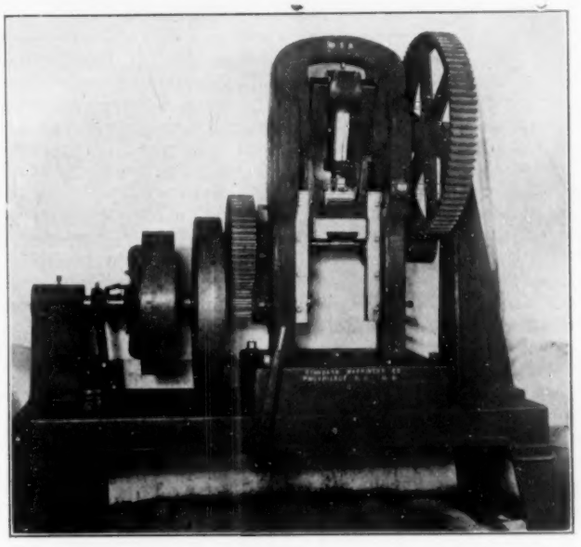
by means of a pair of cap screws (21) which has the effect of producing a tight grip on the spindle, being ample for transmitting all the power which the belt can deliver. Both cones are made of cast iron, finished inside and out.

"In order to provide a quick release for the spinning screw, a device is placed in a bored hole in the nose of the spindle, consisting of a sleeve (25) and a spring split nut (26), the hole being closed by the plug (27) which has a small opening of sufficient size to pass the spinning screw. The sleeve (25) is pressed outward by the spring (29), thus keeping the split nut normally closed. When, however, the handle (24) is shifted, the collar (22) is retracted along the spindle, and through the pin (23) draws back the sleeve (25) which allows the split nut to open and release the screw. This device allows a piece of finished work to be removed from the lathe and a new blank inserted without stopping the machine, which effects a saving in time of about 25 per cent. on small work, due to the high speed at which these lathes run. The split nut is made of case-hardened steel, as are also the spinning screws, thus insuring long life of the thread."

Special information regarding these lathes may be had by corresponding with the manufacturer, Fritz A. Schulz, Chicago, Ill.

REDUCING PRESSES

The Standard Machinery Company, manufacturers of presses of all kinds, drop hammers, rolling mills, wire drawing machinery, etc., Providence, R. I., have recently brought out a new line of reducing presses made in three sizes, Nos. 4, 7 and 9-R. It is stated that the type of the No. 7-R is the same as the No. 4-R with the exception of the weight and general dimensions. The No. 9-R, shown in cut, is fitted with double trained back gearing and side friction clutch with brake on the balance wheel. The above-named machines are used extensively for redrawing, broaching and reducing. The largest of the three has been installed extensively in the seamless tubing concerns for the production of tubing, of gold, silver, brass and other metals. It is also extensively used for making socket, large shells and other sheet metal work where drawing is required.



THE 9-R REDUCING PRESS OF THE STANDARD MACHINERY COMPANY.

The machines are all extra heavy and rigid design; they are fitted with single train of gearing, fitted with a double two-point friction clutch which allows the stroke to stop in any position by the depression of the treadle.

Some of the general dimensions of the machine are as follows:

NO. 9-R REDUCING PRESS.

Net weight	10,500 lbs.
Wheel	700 lbs.
Face of wheel, 5¼; diameter	36 ins.
Stroke	14 to 18 ins.
Ram Adjustment	4 ins.
Distance between uprights	19 ins.
Clutch pulley	30x7 ins.
Size of bottom of slide	13x8 ins.
Gear ratio	24½ to 1
Floor space	8 ft. x 3 ft. 9 ins.
Overall height	9 ft.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

AMERICAN FOUNDRYMEN'S ASSOCIATION.

President, Joseph T. Speer, Pittsburg, Pa.; Secretary and Treasurer, Dr. Richard Moldenke, Watchung, N. J. All correspondence should be addressed to the secretary, Dr. Richard Moldenke, Watchung, N. J. The objects of the Association are for the educational welfare of the iron and metal industry. Annual Convention the latter part of May or early in June each year, in a succession of cities, as invited. The Convention of 1911 will be held at Pittsburg, Pa., May 22-27, 1911.

Secretary Moldenke reports that the work on molding sands is progressing apace. The Ohio Geological Survey has turned over several tons of sand samples, embracing all the shipping regions of the State, for investigation along with the association's own collection, making some 120 sands in all. The Department of Geology of Columbia University is at work on samples making a mineralogical investigation, so that information may be obtained on the fluxing characteristic of the sands in question.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS.

President, Theo. Ahrens, Louisville, Ky.; Commissioner, William M. Webster, Chicago, Ill. All correspondence should be addressed to the Commissioner, William M. Webster, 1112 Schiller Theater Building, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December of each year. The Semi-Annual Meeting is generally held at Atlantic City or some other Sea Coast town. The next meeting will be held in Chicago, Ill., March, 1911.

Commissioner Webster reports that the spring meeting of the association will be held in Chicago on March 28-29. A number of new members were added to the list during January.

THE FOUNDRY AND MACHINE EXHIBITION COMPANY

President, Geo. R. Raynor, Niagara Falls, N. Y.; Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill.; Treasurer, J. S. McCormick, J. S. McCormick Co., Pittsburg, Pa. All correspondence should be addressed to the Secretary, C. E. Hoyt, Lewis Institute, Chicago, Ill. The objects of the Association are for the commercial and technical education of iron and metal industries by co-operating with all foundry and manufacturing interests in making an annual exhibit of supplies and equipments in conjunction with the meeting of the American Foundrymen's Association. The next exhibit and convention will be held in Pittsburg, Pa., May 22-27, 1911.

During the past month the company has made the final arrangements for holding the next exhibition at Pittsburg. The secretary announces that they have secured the buildings of the Western Pennsylvania Exposition Society and that the outlook is that the coming exhibition will be the best and largest that the company has ever held.

The exhibition buildings are situated on the "point" of Pittsburg, within walking distance of the business center. They are buildings that are used every year for exposition purposes. The total floor space in all the buildings is 65,000 square feet, and exhibitors can ship their exhibits by railroad directly into the show grounds. The exhibition will be open between the hours of 9 a. m. and 6 p. m., and also on Monday, Wednesday and Friday evenings from 7 to 10:30 o'clock, giving all the local foundrymen a chance to see the show.

The cost for space has been put at fifty cents per square foot, with an additional charge of $10 for corner space, and a fee of $25 for an exhibition permit. Besides the arrangements for the exhibits and exhibitors which are said to be better than at any previous convention the committee have also arranged to have wholesome entertainment to be held right in the exhibition grounds.

During the week, as usual, the allied societies, The American Foundrymen's Association, The American Brass Founders' Association, and the Associated Foundry Foremen, will hold their annual conventions in Pittsburg, and in the same buildings with the Foundry and Machine Exhibition Company.

The executive board of the company and the secretary are highly pleased at the outcome of the negotiations with the Pittsburg people and all are now taking every step to make the coming convention a complete success.

NATIONAL ELECTROPLATERS' ASSOCIATION OF THE UNITED STATES AND CANADA

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Geo. B. Hogaboom; Recording Secretary, Royal F. Clark. All correspondence should be addressed to the Corresponding Secretary, Geo. B. Hogaboom, 656 Hunterdon St., Newark, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

At the last regular meeting held January 27, 1911, there were thirty-one members present. After a discussion on the society's relation to trade journals it was decided to abide by the vote of the September meeting, forbidding all trade journals to reprint articles published in the association quarterly. The rest of the meeting was devoted more or less to the arrangements for the annual banquet to take place on February 11th. The prospects for the dinner were very encouraging and also the reports from the branch societies. Mr. Blassett, a member from Connecticut, spoke a few words about the platers of the Nutmeg State. A feature of the evening was the exhibition by Mr. Davis of some finely lacquered goods.

The fifth regular meeting of the Philadelphia branch was held at Dooner's Hotel, Friday, January 27, with seventeen members present. Two applications for membership have been received during the past month. At least eight or ten members expected to attend the banquet in New York, February 11. A committee of three was appointed to form plans for a social evening sometime during March or April, at which the president will present the association in a body with its charter.

Some interesting papers were read, among which were those of Arthur B. Wells on silver plating hollow ware, and F. C. Clement on pigment verde. Beginning with the February meeting Hugo Hermanns will give a series of talks on the electrical side of plating. Mr. Benoliel of the International Chemical Company will speak on electric cleaners at the March meeting.

SECOND ANNUAL BANQUET OF THE PLATERS

The second annual dinner of the National Electro-Platers' Association was held at the Hotel Marlborough, New York, on the evening of February 11, 1911, and the dinner was in every respect a very successful affair. There was a larger attendance, greater interest and more genial comradeship than at the first banquet of 1910. The informal atmosphere of the occasion was a strong indication that the "plater" has at last decided to "come out of his shell." The improvement was due no doubt to the more intimate acquaintance of the members which has been brought about through the monthly meetings. The spirit of the evening was shown in the menu card which we herewith reproduce:

The whole evening was spent pleasantly, instructively, and entertainingly, and we herewith print as much as our space will permit the speeches of the different speakers.

The address of the president, Charles H. Proctor, which was entitled "Forward," was in part as follows:

". . . This association of men who constitute themselves, the National Electro-Platers' Association of the United States and Canada, while they cannot govern their own destinies, still they are keeping step with the march of time. They are going forward, they are using every effort to make this association a landmark upon the face of time, to keep step with the continuous evolution that is taking place every day and by their individual and united efforts strive to place their organization side by side with the great industrial associations of a like description. From the North, South, East and West and Canada it is receiving a continual addition to its membership. Men that are interested in the art of electro-deposition of metals realize that by becoming one of its votaries they are not only helping themselves, but they are helping their profession to maintain a higher standard that will not only benefit them financially, but will also benefit their employers in maintaining a higher efficiency in the manufacture of their products. In proof of the association's forward development, in a little less than a year and a half, it has been enabled by the energy and activity of its members to create its own official organ, giving to its distant members in pamphlet form, under the title of the National Electro-Platers' Quarterly, its official transaction and the papers upon various subjects placed before the association, by its members for their consideration. In October, 1910, the association organized the Philadelphia branch, which is developing rapidly. The enthusiasm shown by the members is proven by their efforts to present papers upon interesting topics, that not only give prestige to the association, but gives the members an opportunity to display that inherent ability which years of patience in their adopted profession has enabled them to acquire. I have proven to you that this association is continually going forward and why; because of the continued co-operation of its members.

"Going forward based upon co-operation is what this associa-

SECOND ANNUAL DINNER, NATIONAL ELECTRO-PLATERS' ASSOCIATION.

SECOND ANNUAL BANQUET

OF THE

National Electro-Platers Association

OF THE UNITED STATES AND CANADA

FEBRUARY 11th, 1911

Hotel Marlborough New York, N. Y.

MENU

French Gray Buzzard Bay Oysters

Verde Antique Olives Royal Red Radishes

Ivory Celery

Chicken Soup a la Roman Gold

Short-Circuited Bluefish

Frais de Nickel Solution

Pommes Tripoli

Electro-Cleaned Tenderloin of Beef

with Rod Connections and Cut Up Bus Bars

Punch au Potassium Cyanide

Oxidized Squab Chicken on Bronzed Tablets

Acid Green Salad

Frozen Nobilis Rings

Spray Lacquered Swabbing Sponges

Carbon Bi-Sulphide Cheese

Silver-Plated Wafers

Potassium Sulphurette Solution

tion is endeavoring to accomplish for its members. To raise the standard of the profession and develop that individual man power, that inherent ability that I know from my own years of experience must be in every true and successful electro-plater. I thank you one and all for your attendance this evening. I trust you have spent a pleasant hour or two with us, and hope that when another year rolls around you will be with us again. To the speakers and guests of the evening, I extend to them the thanks of the association for kindness in being present with us and helping to make this evening such a success. To the officers and members of the association and members of the banquet committee, I extend to you my personal thanks for your successful culmination of this, our second annual banquet."

A feature of the dinner was the presentation of a charter to the Philadelphia branch of the association, which charter was handsomely engraved and framed to suit the occasion.

In presenting the charter to the Philadelphia branch Dr. W. A. Jones, chemist of the Celluloid Zapon Lacquer Company, New York, made a few appropriate remarks in which he expressed his appreciation of the opportunity afforded him by the occasion and wished the branch association every degree of success.

F. C. Clement, in accepting for the Philadelphia branch the charter presented to them by the National Electro-Platers' Association, wished to thank the National body for the interest shown to the Philadelphia branch and hoped that with the cooperation of the National body they would continue to increase the number of their membership in Philadelphia and be a credit to the National Electro-Platers' Association.

Dr. Joseph W. Richards, professor of metallurgy at Lehigh University, South Bethlehem, Pa., spoke in part as follows:

"While your industry represents but a small fraction of the present field of electrochemistry, yet you may be proud of the fact that your predecessors in the electro-plating business were the very first commercial electrometallurgists. Fifty years ago, before the dynamo was invented, and when the only practical source of electric current was the battery, your predecessors were plating gold, silver and copper, and this constituted the extent of the electrometallurgical industry. You may, therefore, be proud of the fact that you represent the oldest branch of practical electrometallurgy.

"As I look around and see the vigorous and strong faces before me, I realize that you are the brains of the electro-plating industry. When I compare the rôle which labor plays in industry, I cannot help thinking that intelligent labor really supplies the brains, and that while capital supplies a very necessary part of the business it supplies a part of very inferior quality to 'brains.' Electro-plating was directly developed by cut-and-dry, rule-of-thumb methods, which resulted in practical processes being found after long years of effort and experiment. But what is now needed to supplement the experience of the practical man is clear-cut, scientific investigation of all the facts with which the electro-plater has to deal. We should know as far as it is possible to know, exactly why and wherefore these processes work as they do; there is much mysterious about many of your processes and it needs the light of scientific investigation to make their workings clear.

"In this connection, let me plead for a wider field for your profession, and a wider scope for your investigations. You cannot know too much of the facts of chemistry and physics; and you can learn very much of immediate practical use in studying the other branches of electrometallurgy and electrochemistry. For instance, a most accurate investigation of the conditions for exact electro-deposition are to be found in such a work as Dr. E. F. Smith's manual of quantitive electrochemical analysis; it contains a large amount of information of great value to the thorough student of electro-plating.

"I see also among you many comparatively young men. Whenever possible, send the bright, promising young man to a college or university; let him take a general scientific or technical course. Once in a while a good blacksmith or bricklayer is spoilt by sending a man to college, but I really think that for one man that college spoils, by perhaps giving him a 'swelled head,' it probably benefits ten or a dozen; and it benefits them in this way, which is just in line with what I have been saying to you, that it gives them a proper outlook on their progression, it instructs them in matters of direct and indirect use in electro-plating, and it gives the man a strong mind, such as prepares him to rise to the very top of his profession.

"In closing these few remarks, allow me to again press it home that the highest progress in your profession can only be attained by adding scientific investigation to practical experience, that there are many unsolved problems in electro-plating which can only be resolved by proper scientific experimenting. You can thus promote in this way the best interests of your profession. Finally, allow me to thank you for the good dinner, the good fellowship and the close and patient attention which you have granted me."

Erwin S. Sperry, of Bridgeport, Conn., spoke on "The History of Electro-plating." His address was a noteworthy compilation of the introduction of the different processes which are mentioned in the various books on plating. The speaker enlivened his talk with his own and his father's personal experiences with platers and said that many of the processes which were lauded as new could be found in the books on plating and cited one case from Roseleur's book to prove his assertion. He said in part:

"The plating industry owes its inception in the United States to the Naugatuck Valley of Connecticut as also the brass industry of the United States. In 1799 the first continuous battery was used and that in 1805 the first application of it was made in the operation of electro-plating. In 1840 Elkington & Company, Birmingham, England, first took out a patent for silver plating; previous to this time they were engaged in gold plating by dipping. The Elkington patent, ignoring the patent of C. A. Jordan in 1835, was really the beginning of the plating industry in the world. It is now some seventy years since this patent was granted, and if we look back to take into consideration silver plating we can see very little change. They used the solution of cyanide containing silver salts and deposited in the same manner as today. With a few minor considerations of apparatus the process is unchanged from that first carried out in England and to the best of knowledge it was some seven years afterwards in 1847-48 that it was first introduced in this country in Meriden, Conn."

The speaker then related the changes after 1840, how britannia metal was largely used, and cited the growth of the art to the present time.

George M. Howard, chief chemist of the Electro Storage Battery Company, Philadelphia, Pa., spoke upon the storage battery. He started out by giving a technical description of the construction and operation of such batteries. He told of the many advantages accruing to the electro-plating industry from the use of storage batteries, and he very strongly urged that platers who were not now familiar with and were not using storage batteries to do so.

The officers, members and guests present were the following:

Charles H. Proctor, president; H. H. Reama, treasurer; George B. Hogaboom, corresponding and financial secretary; Royal F. Clark, recording secretary.

The Philadelphia charter committee, William Schneider, Richard Sliter and A. D. Havens.

The dinner committee, August G. Hoffman, Richard H. Sliter and George B. Hogaboom.

Guests: Dr. Joseph W. Richards, Prof. Charles A. Colton, Prof. J. O. Frey, Dr. William A. Jones, Erwin S. Sperry, George M. Howard, S. D. Benoliel, Frederick C. Clement, A. M. Clark, Palmer H. Langdon.

Members: Frank Dressel, F. W. Matts, Jr., Edgar D. Proctor, Edward E. Newton, A. S. Wheeler, N. S. Emery, G. W. Campbell, W. R. King, George E. Prentice, Frank L. Traut, James G. Brown, Wm. F. Clark, George Roberts, L. Banneford, H. H. Smith, J. M. Dunn, C. C. Mace, Jr., M. Donnelly, Wm. Fischer, Emil Troxler, Michael Faughman, H. C. Flanigan, John J. Courluitcy, F. N. Graham, Wm. Schwemmer, Frank P. Davis, John C. Rall, George E. Irwin, E. M. Stephenson, G. Karl, H. S. Wyckoff, L. E. Sturdevant, A. J. Taylor, Henry S. Leggett, G. H. Niemeyer, D. W. Webster, William Muller, H. M. Dawson, W. D. Agnew, L. H. O'Donnell, C. H. Buchanan, A. Wick, C. A. Stiehle, J. Feiner, George Reuter, Jr., George E. Osborne, Samuel R. Taylor, J. W. Slattery, George H. Cartlidge, Frederick Kuehne, Frank A. Kusch, T. F. Slattery, Walter Schmidt, Harry R. Proctor, T. Noonan, Charles Petersen, James A. Carroll, Wm. Voss, Chas. A. Cooper, Edgar Boissier, A. A. Merz, G. W. Cooper, C. G. Backus, C. B. Leeser, W. L. Morris, L. M. Lesch, Harry Farrell, Alexander A. Archibald, M. S. Rorrad, H. G. Ritter, W. H. Betz, Jos. A. Straub, Jr., W. C. Groesser, A. Back, J. Minges, Harry Wohl, Walter Mitchell, Thos. B. Haddow, Jr., John E. Hartnett, John Steinlecher, Richard Dipple, James A. Duff, Gustavus Kelch, H. Sheldon, Frederick W. Goerdes, Roy S. Stout, A. W. Baumler, Nelson A. Barnard, Chas. Koch, Frederick Koch, F. Groh, Wm. Keefe, Frank Kirkhuff, H. C. Bernard, Robert Cole, A. D. Havens, Richard Zilberman, J. J. Doherty, A. B. Wells, John A. Wilkinson, August Heck, Albert E. Kieser, Wm. J. Buckley, Hugo Hermanns, M. H. Smith, Walter C. Gold, A. K. Kendrick, B. Popper, S. Seams, Thos. A. Trumbour, R. F. Clark, John Williams, Jr., M. F. Whelen, J. W. De Mars, Edward Faint, John Wass, E. Blassett, Jr., J. A. Stremel, James S. Phelps, W. J. Smart, N. P. Miller, E. Millwater, John Painter, Edwin Lyding, George Berthold, Dr. A. Tessler, A. Wurth, Augustus H. Dulie, E. Mullard, Harry Sherman, Hugh Baxter, H. Keppler, C. J. Welcke, John Fanncn, Joseph Dimes, J. A. Garde, Clinton De Baun.

PERSONALS

ITEMS OF INTEREST TO THE INDIVIDUAL.

CHARLES M. HALL

Charles M. Hall, the vice-president of the Aluminum Company of America, as is well known, was the discoverer contemporaneous with Paul Heroult, of the present method for the production of aluminum. Dr. Hall in 1886, when he was twenty-two years old, found that it was possible to dissolve alumina, the aluminum bearing clay in a molten bath of cryolite; then by applying the electric current he was enabled to produce metallic aluminum. This formed the basis of the famaus Hall patents on the process for the production of aluminum which, however, have now expired, the first of these patents having been granted in the United States in 1889.

CHARLES M. HALL.

From a very modest beginning, and after discouraging setbacks caused partially from unfortunate business associations and partially from attacks made upon the validity of the basic patents, an industry gigantic in scope and international in character has grown out of Dr. Hall's initial invention. The Aluminum Company of America, which is the outcome of the different concerns promoted by Mr. Hall, is now the only producer of aluminum in the United States and Canada, and its output is placed at forty million pounds of aluminum at an average value of twenty-five cents per pound. A most remarkable achievement when it is considered that in 1889 aluminum was selling at $4 per pound.

As a partial reward for Dr. Hall's accomplishments in the line of industrial metallurgy, he was awarded on January 20, 1911, at the Chemists Club in New York City, the William Henry Perkin medal, a medal that is annually awarded for important discoveries in applied chemistry.

Dr. Hall in replying to the presentation speech made at the meeting by Professor Charles F. Chandler of Columbia University, gave a graphic description of his experiences in the production of aluminum from the time he made his original invention up to the present.

Walter H. Perkins, superintendent of the Waterbury Manufacturing Company, manufacturers of brass goods, Waterbury, Conn., has resigned his position. Mr. Perkins has been in the employ of the company for the past twenty-five years, and has been the superintendent for 10 years. He is now in his thirty-ninth year and started with the company at the age of thirteen as office boy and worked his way up to the superintendency. Mr. Perkins has had a wide experience in manufacturing and selling of brass goods and has taken out quite a number of patents which have been reviewed in THE METAL INDUSTRY from time to time. At the present writing Mr. Perkins is resting at his home in Cheshire, Conn., for a few weeks before making any plans for the future.

George H. Wadsworth, for the past fifteen years superintendent of the Falls Rivet and Machine Company, Cuyahoga Falls, Ohio, has resigned his position and will on and after the first of March devote his entire time to the Wadsworth Core Machine and Equipment Company, of Akron, Ohio, he having purchased all machinery, patterns, tools and interest from the Falls Clutch and Michinery Company, successors to the Falls Rivet and Machine Company, for the manufacture of the Wadsworth core machine and equipment as manufactured by them for him during the last seven years.

C. P. Karr, a contributor to the columns of THE METAL INDUSTRY, and for the past three years metallurgical chemist for the Nathan Manufacturing Company, New York, manufacturers of steam injectors, etc., has resigned his position to take effect March 1, 1911. Mr. Karr has not completely formulated his plans for the future, but it is hoped that he will not wander far from New York City, as his presence will be greatly missed from the gatherings of the various scientific organizations of which he is a member.

E. J. Woodison, who has been a member of the firm of the Detroit Foundry Supply Company, of Detroit, Mich., has resigned from the company and has started a business of his own called the E. J. Woodison Company, which will deal in fire brick and foundry requisites. Mr. Woodison is well known to all foundrymen and took a prominent part in the Foundrymen's Convention held at Detroit, in June, 1910.

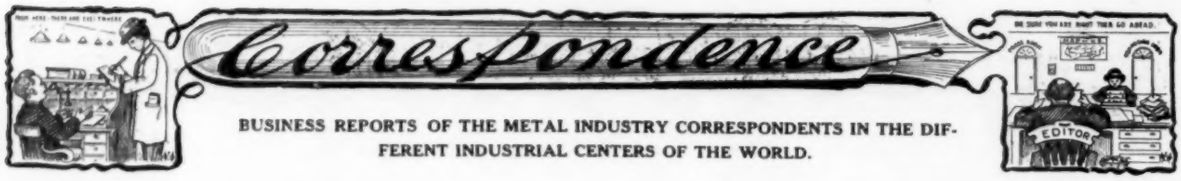
DEATHS

BENJAMIN H. CRAMP

Benjamin H. Cramp was born in Philadelphia, November 13, 1853, and died in the same city, January 10, 1911. He was the third son of Charles H. Cramp. Benjamin H. Cramp served his apprenticeship with Bement-Miles & Company, the celebrated tool makers of Philadelphia, and learned the foundry business with that company and with the I. P. Morris Company, the oldest engineering company in the United States. He subsequently bought a foundry in Kensington owned by John Bradford. Later his brother, Howard, became a member of the firm under the name of B. H. & H. Cramp, and a few years afterward his brother, Courtland D. Cramp, was admitted to the firm and the name was then changed to B. H. Cramp & Company.

BENJAMIN H. CRAMP.

For a number of years, during which the inception of "The New Navy" took place, B. H. Cramp & Company was known as one of the leading brass foundries in the country, especially in the making of very large castings. In 1892 the foundry of B. H. Cramp & Company was purchased by The Wm. Cramp & Sons' Ship and Engine Building Company, and Benjamin H. Cramp was appointed superintendent. Benjamin H. Cramp was one of the first brass founders in the United States to recognize the necessity of employing in this business the science of metallurgy and chemistry and this department of his foundry was always maintained at a high point of excellence. The Cramp foundry has made the largest castings in the United States.



BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

PROVIDENCE, R. I.

FEBRUARY 6, 1911.

Members of the Master Sheet Metal Contractors' Association held their fifth annual banquet at the Crown Hotel, this city, on the evening of February 2, and listened with pleasure and interest to an address by Edwin L. Seabrook, of Philadelphia, national secretary of the association. He amused his hearers by remarking that Rhode Island "is bossing it over the association."

Thirty-six diners, including as guests members of the recently organized locals of the association in New Bedford and Fall River, were seated about the dinner tables. Mr. Robert T. Bradley, president of the national association, presided and spoke enthusiastically of the marvelous growth of the association, which extends, he said, as far South as El Paso, Texas, and West to the Golden Gate of California. He attributed the wonderful expansion of the organization primarily to its own merits.

At the annual meeting of the Manufacturing Jewelers' Board of Trade at the rooms of the association in this city the reports of the secretary, treasurer, manager, and special trustees showed that the association was in a flourishing condition financially with a membership of 277 members. The directors elected for the ensuing year were as follows:

Providence—Robert E. Eudlong, of S. K. Merrill Company; William P. Chapin, of Chapin & Hollister Company; Everett L. Spencer, of E. L. Spencer & Co.; Edward B. Hough, of Wightman & Hough Company; Alfred K. Potter, of E. A. Potter & Company; L. H. Bosworth, of the Potter & Buffinton Company; George H. Holmes, of George H. Holmes & Company; Fred D. Carr, of the Ostby & Barton Company; Frederick A. Ballau, of B. A. Ballou Company, Inc.; Harry Wolcott, of the Wolcott Manufacturing Company; William T. Chace, of C. H. Cooke & Company; Charles A. Russell, of the Irons & Russell Company; Horace W. Steere, of Arnold & Steere, and Everett I. Rogers, of Parks Bros. & Rogers.

Attleboro, Mass.—Herbert C. Bliss, of Bliss Bros.; C. J. McClatchey, of Horton, Angell Company; Harold E. Sweet, of R. F. Simmons Company; Edward L. Gowen, of the Standard Button Company, and Maurice J. Baer, of the Attleboro Manufacturing Company.

North Attleboro, Mass.—George A. Whiting, of Sturtevant & Whiting; George G. Wheeler, of W. & S. Blackinton Company, and Ira Barrows, of H. F. Barrows Company.

Woodbury Melcher, of Scofield, Melcher & Scofield, of Plainville, Mass.; John W. Pickering, of Pickering, Metcalf Company, of Leominster, Mass., and Henry Untermeyer, of Charles Keller & Company, of New York.

At a subsequent meeting of the directors the following officers were elected: President, Fred D. Carr, of Providence; first vice-president, Charles A. Russell, of Providence; second vice-president, Herbert C. Bliss, of Attleboro; secretary and treasurer, Marcus W. Morton, of Providence; manager, Horace M. Peck, of Providence; executive committee, Fred D. Carr, Alfred K. Potter and Everett L. Spencer; auditing committee, L. H. Bosworth, C. J. McClatchey and Edward B. Hough; trustees of the Special Fund, Dutee Wilcox, William H. Waite and William P. Chapin.

Increases in the shop room of R. Berberian's enameling plant at 14 Blount street provide for about 4,000 square feet of additional space. Business in all lines of metal work in this city and vicinity was never better at this time of the year than at present. All of the manufacturing jewelry establishments are working full time and other lines have all they can do to keep pace with their orders. The outlook is equally as good and on all hands are heard the most encouraging reports. Failures throughout the country in which local manufacturers and others are interested have been few and for small amounts; collections are coming in promptly and the most optimistic atmosphere surrounds all the industrial concerns. Thomas F. Carlisle, of Providence, has been granted a patent on a process for making seamless wire, which he has assigned to the Improved Seamless Wire Company, of Providence.

The James E. Blake Company, of Attleboro, have sold the German silver bag department of its business to the Holbrook Manufacturing Company. The sale includes dies and tools and also goods in process of manufacture at the Blake establishment.

The Nickerson Art Metal Company, of Pawtucket, continue to be hard pressed with orders for mesh bags by the manufacturing jewelers of this city and vicinity. They are operating its factory with two sets of hands, thus getting about twenty hours of labor a day. The concern has introduced special machinery for the making of these bags but report that the demand increases faster than the goods can be produced. W. H. M.

NEWARK, N. J.

FEBRUARY 6, 1911.

The jewelry factories are not going strong, some few are quite busy who are selling to the jobbing trades, the others are not doing much. A greater proportion of the manufacturers here sell to the retail trade direct, thus saving the jobber's profits, and they do not do much business till March or April. The jobbers are sending out their salesmen and doing a fairly good business. There are a number of new firms starting in the manufacturing lines and they will need considerable machinery and plating supplies. There will be several firms that will be moving during the next three months and they will all enlarge or make improvements.

The latest new firm to open up for business is the Royal Silver Manufacturing Company, of 46 Oliver street, who will make silver mesh bags and novelties. W. T. Goldsmith, the president, was with the Goldsmith-Koch Company and R. Udill, secretary and treasurer, was with the Jennings Silver Company.

Edward Reitz and Company is a new firm at 68 Orchard street to manufacture 14-karat gold jewelry and will later enlarge the line and manufacture a greater variety. John F. Weber, of the Unbal Novelty Company, is interested as well as Edward Reitz, who was foreman for John D. Dalzell & Company. Salesmen will be put on the road.

The report previously made that James N. Morehouse has recently sold out was erroneous. Changes have been made, however, with this firm and the Newark Plate Engraving Company. Mr. Morehouse sold his interest in the plating business some years ago, but is not now connected with the latter firm, either.

Enthusiastic preparations are being made by the Jersey members and a large attendance is looked for from the city at the second annual banquet of the National Electro-Platers' Association at the Hotel Marlborough, New York City, February 11. Probably most of those in attendance will be from New Jersey, or at least more than from any other State.

Lebkucher & Company, who were burned out on Prospect street, have now refitted the factory and are in good running order. They make silver novelties and have filled orders regular notwithstanding their being burned out.

Frish Bros., in the Richardson building, doubled their space and doubled their output of gold bags, combs and general line of gold jewelry. More machinery was added and extra help put on.

Whiteside & Blank doubled their space in the Schlosstein building not long ago and have enjoyed a good demand for their goods.—H. S.

DETROIT, MICH.

FEBRUARY, 6, 1911.

The brass industries in Detroit have not experienced a very good run of business during the past thirty days. Every plant visited has been found to be running light and depending much on the future. This condition of affairs is noted particularly in the brass jobbing establishments that are manufacturing automobile parts. Contrary to expectations the automobile business has not opened as early this season as usual and no improvement in conditions in this line will be noted until after the factories begin running to their fullest capacity. Two automobile shows were held in Detroit during the past month and it was thought after these were over that business would brighten up at once. While these exhibitions gave every indication of heavy business later in the season there seems to be a drag somewhere that retards operations. It is not meant by this that the many factories in Detroit are at low tide, for they are not. Nearly every plant is operating. The most of them are also engaged in making repairs or enlarging their buildings or building new ones. Continued progress is noted, but the output now is at the lowest that it has been for a long time.

Dealers from all parts of the country, however, give assurance that there will be no let up in the demand when the season is fully opened. The two shows here brought many dealers to the city from all parts of the country and they are enthusiastic over the future. Because the large automobile plants are running at low tide the manufacturers who produce brass parts for machines are also forced to run low. This condition has been gradually developing for the past three months, in fact since the late fall and winter months began. They are running just enough to keep their plants in operation. Many following the example of the large automobile plants are also making repairs and increasing their capacity. The automobile industry is so great in Detroit that one hardly realizes that the industry is at low tide. Thousands of men are still employed and others will be taken on when the rush begins on spring work. The Brush, Ford, Packard, Cadillac, Hudson, the E. M. F. and Chalmers are all employing a large number of men, and are planning for a heavy business during the coming season.

About the same conditions exist in the manufacture of valves and other plumbing necessities as has continued for some time. The factories are all running, but, of course, are not doing the same volume of business that they did late last fall. This, of course, is due to the cold weather shutting off building operations. Nearly every manufacturer engaged in this line of work anticipates a decided change as the spring months bring good weather and permit the resumption of building operations. Many plants, of course, have been taking inventory and still others have the work under way. Notwithstanding, manufacturers are lining up for a good business throughout the busy spring and summer months.

At the annual meeting of the National Fulton Brass Manufacturing Company held recently, the following officers were elected: President, John F. Harrigan; vice-president, Frank E. Beal; secretary-treasurer, A. J. Schiffington; directors, the officers and H. H. Hewitt, of New York, and C. M. Hewitt, of Chicago. The annual meeting of the Climax Bearing Company also was held at the same time. The new officers elected are the same as those of the brass company, although the board of directors is composed of John F. Harrigan, H. H. Hewitt and A. J. Schiffington. Both of these plants are reported to be in excellent condition, and the business outlook is bright.

The Michigan Wire Cloth Company has elected the following officers: President, W. J. Chittenden; vice-president, Frank H. Croul; secretary-treasurer and manager, Hugh O'Connor. The officers, with W. H. Brace and Arthur C. O'Connor, constitute the board of directors. The annual report of the corporation filed with the secretary of State shows assets of $246,089.36, with no liabilities.

The Detroit Screw Works: President, W. B. Pearson; vice-president, F. P. Johnston; secretary and treasurer, George Thrall; directors, in addition to these officers, are Fred C. Thrall and John G. Lewis. This concern was recently reincorporated for $100,000.

The Peerless Brass Works gives notice that it has ceased to do business, and the corporation has been dissolved. The notice of dissolution is signed by Vincent J. Quinn and Benjamin H. Hickey. A similar notice has been filed by the Eagal Brass Manufacturing Company and is signed by J. Rosenzweig and Edwin C. Fleischman.—F. J. H.

BUFFALO, NEW YORK.

FEBRUARY 6, 1911.

The Western New York Chemical Society held a banquet at the Hofbrau Restaurant recently and sixty-five members of the society were present. The banquet was followed by a mock trial, which was based on a supposed civil action brought by Niagara Falls against the City of Buffalo for alleged pollution of the Niagara River. The lawyers for the prosecution were impersonated by Messrs. Saunders, Lidbury, Bennie; and for the defense by Messrs. Sched, Morgan and Hallan. The result was not made public and to date no one knows which side won.

Further action has been prevented in the bankruptcy case of the Robson Smelting Company by an order of prevention which has been made by Judge Hazel in the United States District Court. The affairs of this company have been before Referee in Bankruptcy Hamlin and expect to be settled during the present month.

The Sheet Metal Workers of Buffalo, Local 71, held a smoker last week which was largely attended. An interesting programme of entertainment was given.

The Plumbers & Steamfitters Supply Company, at 106 and 108 Pearl street, suffered an explosion recently which did some damage in their basement. Escaped gas from a gas engine was the cause of the explosion.

The Buffalo Foundry Foremen's Association listened to a speech on the evening of January 31 by Leon Godielle, of Niagara Falls, on "Light and Ornamental Patterns." Julius Boasberg, a wholesale and retail diamond merchant, has moved to the corner of Main and Niagara streets, where he has fitted up handsome display rooms on the second floor.

The Alberger Gas Engine Company, recently incorporated with a capital of $221,000, has substantially all the capital stock of the Howard Iron Works as well as the gas engine business of the Alberger Company. The directors of the gas engine company are A. H. Alberger, president; Harvey L. Brown, secretary; Thomas Heath, J. H. McNulty, William H. Andrews, Walter P. Cook, of Buffalo, and J. P. Gowing, of Chicago, are all interested in the company.

A report from Tonawanda contains an interesting item about a brass fire bell which has for over thirty years sounded the alarm of fire for the townspeople. It has been through one or two fires itself and will now be taken to La Salle where it is expected that it will give as good service as it did for the Tonawanda people, for the next thirty years. Among the new plants recently started in Lockport is the Harrison Radiator Company, which employs a large number of employees.

A most important meeting of traffic men and representatives of the railroads from all over the country was held recently at the Statler Hotel. The toastmaster was B. A. Hegeman, Jr., of New York, president of the United States Metal and Manufacturing Company. The principal speaker was W. O. Taylor, who discussed the action of different oils on metals when used at lubricants.

Among other things Mr. Taylor said: "It has long since been demonstrated that the best of animal oils will rapidly decompose. Their fatty acids corrode metals and their gummy nature proves a source of danger as well as expense," also "that steam cylinders require a viscuous and cohesive mineral oil. The price of oil," he maintained, "is of little importance when compared with the friction reducing power."

Because the engraving of new number plates for automobiles are late in delivery the owners of automobiles in Buffalo have been granted an extension until after the first of the present month, and thus may use their machines, according to the statement recently issued by the Secretary of State. The American Agricultural Chemical Company has just purchased four 30-foot lots for building purposes. H. McG.

CLEVELAND, OHIO

FEBRUARY, 6, 1911.

Business in the metal trades this month continues quite brisk, and the general opinion prevails that 1911 is going to be a big year in the industry. Already the orders are coming in in good shape and from the plans which are being made for expansion there seems to be little doubt but that there will be an unusually busy spring and summer. The automobile trade is in better shape than in months, according to reports. This month there are to be two big exhibits, one for automobiles for pleasure purposes and the other for commercial uses. The factories here are all quite busy in both the foundry and plating departments, and with the business outlook improving it is believed in most quarters that they will enjoy a banner year.

The building industry, which is so closely related to the manufacture of plumbing goods, faucets and similar goods which are made in such large quanities in Cleveland, is usually good for this season of the year. Reports from all over the country indicate that January excelled all other months in the history of the business. The various concerns here making plumbing goods all report a good steady tone to the market. Several of them are preparing to make extensions during the coming season.

The aluminum foundries are all having a good run of business. Many are conducting experiments in behalf of automobile companies and aviators, for aluminum is rapidly increasing in use for automobile and flying machines, particularly the latter. It is expected that 1911 will see many improvements due to the use of this material.

One of the interesting events of the month was the letting of a contract by the county building commission for the bronze doors for the new county courthouse which is being erected at a cost of about $4,000,000. There are to be ten massive pairs of solid bronze doors and ten pairs of vestibule doors, which are to have large plate glass sections above. The contract went to the Williams Company, of New York. The Jackson Company's representatives were present to protest against the award as the Jackson Company claimed it was the only firm which had lived up to the specifications in agreeing to make the delivery by July 1. Notwithstanding this the commission gave the contract to the Williams Company. The vestibule doors, which can be locked, are to be delivered by August 1 and the solid bronze exterior doors by December 1.

Within the next month the same commission will make an award in connection with the lighting fixtures for the same building. The total cost will be about $110,000. These will include all the interior fixtures, estimated at about $70,000. The balance is allowed for great bronze-pillared lights along the outside. It has not been definitely determined if the bronze pillars will be ordered at once or not.

TORONTO, CANADA

FEBRUARY 6, 1911.

The new reciprocal trade programme entered into between W. S. Fielding, the Canadian Finance Minister, and President Taft of the United States, is regarded with much apprehension by the Canadian automobile manufacturers. They are preparing a memorial for submission to the Dominion Government, asking that the present tariff be unaltered, or that the reduction of the duty of 5 per cent. on automobiles be extended to the automobile parts which are imported from the United States. Motors form a big item in the goods obtained from the Republic, and the auto car makers are especially desirous of having these placed on the reduced list.

Metal jobbers do not expect much help or loss from the new arrangements. Certain changes in aluminum ware are not expected to cause disturbance in the industry because these goods are chiefly handled by an American firm which has a branch in Canada.

The plumbers' supply houses do not report much alarm at the lower rate proposed in some branches of their trade. The reduction in wash basins, urinals and bathtubs is not considered extensive enough to disturb the industry.

Canadian manufacturers in policy oppose any lowering of the tariff walls. Makers of agricultural machinery are especially incensed, and will raise a loud protest.

The new tariff in its broad sense will have some effect in opening new channels of trade. Eastern points in Canada will be more closely linked with Eastern points in the United States, and the same will hold true of Western and Pacific Coast centers of trade. In the general change some alterations in the market for metal goods in the West are expected, but a number of Eastern jobbing houses will open branches in Winnipeg this year in order to have a stronger grip on the trade of the Prairies. In general the tariff revision is looked upon as of some benefit to be to the farmers, and their prosperity will affect business in all branches with the result that expansion will continue in the metal and kindred industries. A large party is opposing a move towards reciprocity, but this is regarded by their political opponents as merely owing to sentiment.

Toronto houses dealing in metals and their manufactured products have all been engaged since the beginning of the New Year in taking stock and preparing statements of their profits in the past twelve months. On all sides have come reports of substantial advances in business and of expectations of further increases in 1911. The demand from the Canadian West has increased enormously, and the majority of the large manufacturers of plumbers' supplies and dealers in metals are contemplating the building of branch factories in Winnipeg, the gateway of the Prairie Provinces.

The Canada Metal Company, which transacts a jobbing business in brass, copper, tin, antimony, aluminum and lead reports constantly expanding trade with Toronto, Montreal, Winnipeg and other Western cities. The growth of business has increased so much beyond the present capacity of the plant that a new smelter has been erected, and a new factory is in course of construction.

Prices in metals in Toronto depend, as a rule, on the New York quotations, plus the freight. Owing to the weakness in the prices of most of these metals dealers have been ordering only in small lots, and in many cases deliveries are delayed in order to wait for arrivals from New York. The condition of the tin market has also led to the holding of small stocks thereof. Though this practice has in some cases hindered manufacturers, they have found little loss in waiting for the completion of orders. The Canada Metal Company, Limited, has ceased booking large orders for future delivery till market conditions become more settled.

In the gold beating trade the National Refining Company, Limited, finds keen competition in cheap German gold leaf for bookbinders and sign painters. This imported leaf is an alloy, the exact composition being a trade secret. Prices are quoted so low on this that they can not be met by Canadian makers, who are now confining themselves to the production of gold leaf for the better class of contracts. Owing to the low margin of profit obtaining in this line no attempts have been made by the National Refining Company to capture the Western trade.

The Canada Cycle & Motor Company reports the business bright, with prospects of a greatly increased demand for auto cars. A stiffening in the retail prices of the cheaper grades with the beginning of the year is noted, while the better class of car will sell at about the same figure as last year. The call for automobile parts is large, and with an extensive scheme of road improvement in the country around Toronto under advisement the outlook in this trade is particularly good.

The plumbing trades in particular are expecting a bonanza year. With building permits in Toronto approximating the twenty million dollar mark last year and the prospect of an excess over these figures for 1911, an unprecedented boom in the business is freely predicted. No prospects at present exist of labor troubles, and the erection of many large factories and places of business is already projected. Makers of plumbers' supplies report having received many future orders for the spring trade. Business in this trade for January, as a rule, is light, but it compares most favorably with that of the corresponding months in previous years.

The James Morrison Bros. Manufacturing Company, Limited, report having already a month's business booked ahead. They have secured orders for the brass work on a big proposition of the engines for threshing outfits for the West and in Ontario. The company has just completed installations of machines embodying the most modern improvements in brass manufacturing.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

The stockholders of the St. Louis Brass Manufacturing Company, St. Louis, Mo., recently elected the following directors: E. F. Guth, O. D. Guth, C. M. Wempner, Charles Michel and R. V. Owen.

The H. W. Johns-Manville Company, manufacturers of insulating materials, electric railway supplies, etc., Brooklyn, N. Y., report that they are contemplating the installation of a plating plant in their factory.

An addition of 5,000 square feet of molding floor space has recently been made to the foundry of the Youngstown Bronze & Iron Foundry Company, Youngstown, Ohio, manufacturers of gray iron castings, pipe balls and bell dies.

The Pacific Burial Case Company, Inc., manufacturers of caskets and undertakers' supplies, Los Angeles, Cal., are installing an electrogalvanizing plant to heavy zinc plate iron and steel work previous to nickeling in order to produce a rust proof deposit.

The Vanadium Metals Company, manufacturer of Victor vanadium bronze, brass, aluminum and anti-friction metal, East Braintree, Mass., will erect a foundry at Groton, Conn., 63 x 227 feet, and later on will be in the market for machinery and other equipment.

The Kinsey Manufacturing Company, manufacturers of automobile parts, Toledo, Ohio, have recently completed a new plant, the main building of which is three stories in height and covers a plot 105 x 286 feet, to which is joined an L 65 x 75 feet.

The Bay State Brass Company, manufacturers of brass fittings, Haydenville, Mass., was recently sold at auction, going as a unit to H. J. B. Willis, New York, for some of the creditors. Operation will begin immediately under the management of S. S. Cassard.

John C. Blevney, manufacturer of polishing machinery and friction clutches, whose factory was burned out a few weeks ago, announces that he is now well etsablished in his new afctory at 209 Parkhurst street, Newark, N. J., and that he has better manufacturing facilities than ever.

The following officers and directors were elected at the annual meeting of the Brass Products Company, Southington, Conn.: President, James H. Pratt; secretary-treasurer, W. R. Miller; directors, J. H. Pratt, W. R. Miller, E. V. Lewis, John Hemingway, C. C. Chamberlain, E. H. Rogers and C. F. Hamlin.

Announcement is made that the co-partnership formerly existing between William F. Hayes and Harry A. Macfarland under the firm name of Hayes & Macfarland, platers and silver depositors, has been dissolved by mutual consent. The business will be continued by Harry A. Macfarland, Mount Vernon, N. Y.

At the recent meeting of the stockholders of the Standard Brass Manufacturing Company, Utica, N. Y., the following officers and directors were re-elected: Theodore J. Ward, William W. Ward and Walter C. Ward, directors; Theodore G. Ward, president and treasurer, and C. L. Stocking, secretary.

The Backus & Leeser Company, 410-412 West 13th street, New York, manufacturers and dealers in platers' and polishers' supplies, announce that they have concluded arrangements to handle the complete line of polishing and buffing lathes formerly sold by the Zucker & Levett & Loeb Company, including the "IXL" and other well-known styles.

The administration building connected with the new plant of the Lozier Motor Company, Detroit, Mich., is nearing completion, and the officials and employees of the general offices are preparing to leave their present quarters in New York City, and it is expected that the entire executive force will be doing business in the new Detroit headquarters.

The Northern Engineering Works, Detroit, Mich., have recently made the following installations of Northern cranes: Gregg Company, Newburgh, 8-ton, 80 feet; Anderson Forge Company, two 10-ton; Pierce Phosphate Company, 25-ton, 70 feet; Detroit River Tunnel Company, one 25-ton; Pennsylvania Terminal, one 25-ton; Dodge Brothers, 10-ton and 15-ton.

The New Jersey Zinc Company, New York, expects to close down the oxide department of its South Bethlehem plant in a month or six weeks, because it is being replaced by a modern plant, now under construction at Palmerton, Pa. It is understood that the spelter plant of the South Bethlehem works will be kept in operation on account of the ready market for its product.

Beginning January 1, 1911, H. D. Cole took over the exclusive representation in the New England territory of the Jonathan Bartley Crucible Company, Trenton, N. J. Mr. Cole has had an extensive experience in the manufacture of graphite crucibles, and is thoroughly familiar with both their manufacture and use. His experience will undoubtedly prove a very valuable asset, not only to the company he represents, but also to his customers.

The entire plant of the Continental Silver Company, manufacturers of casket hardware, Scottdale, Pa., including real estate, plant, tools, machinery and supplies, has been sold to A. C. Overholt of Scottdale, and will hereafter be known as the Continental Casket Hardware Company. E. F. Doorley, general manager; Charles Coughenour, foreman; and Robert E. Collins, foreman plater, have all been retained by the new concern.

In the January issue of THE METAL INDUSTRY reference was made on page 59 to the firm of Fitz, Dana & Brown, 110 North street, Boston, Mass. This was an error, as the name of the Boston house at that address is Fitz, Dana & Company, while Fitz, Dana & Brown is their New York connection, located at 441 to 447 Pearl street. Both these houses are old-established, and large dealers in all kinds of metals, and large stocks are carried by both.

The Ryder Brass Foundry Company, manufacturers of brass, bronze and aluminum castings, manganese and phosphor bronzes and special alloys, Bucyrus, Ohio, has recently been incorporated with a capital stock of $10,000. The officers are W. H. Whitmore, Akron, Ohio, president; E. W. Ryder, vice-president; P. H. Ryder, secretary and treasurer; and Arnold Lenz, general manager and superintendent, all of Bucyrus. The foundry is a modern brick structure with a capacity of thirty tons per month, and the force of six men have all the work they can handle.

During the first week in January, The Osborn Manufacturing Company, manufacturers of molding machines and foundry supplies, of Cleveland, Ohio, held its annual convention. This proved to be the most profitable meeting ever held by the Osborn organization. It signalized the closing of a successful year of work and the return of the sales force, bringing their optimism and enthusiasm to the stay-at-homes, whose loyal co-operation throughout the year furnishes the solid foundation on which the success of the salesmen is based.

The Electrical Alloy Company, manufacturers of guaranteed resistance materials, Morristown, N. J., are now placing on the market a new alloy called Grade "C." This is a pure nickel-copper alloy, having a resistance of 164 ohms. This material is claimed to be non-corrosive and does not become brittle with repeated heating and cooling and is intended to replace 18 per cent. German silver. The same company is also putting out a new high grade phosphor bronze armature banding wire, manufactured from an imported alloy. Information can be obtained about these two new materials by addressing the above company.

It is reported that the main offices of the Aluminum Goods Manufacturing Company will soon be established at Manitowoc, Wis. This company was organized two years ago by consolidation of plants at Wanitowoc, Wis., at Two Rivers and at Newark, N. J., and is the largest aluminum goods manufacturing concern in the world. George Vits of Manitowoc, has been elected president and general manager, and Joseph Koenig, of Two Rivers, vice-president and superintendent of factories of the company. The Citizens' association has raised money and will purchase property for the company to erect a four-story brick addition to its local plant which, with the addition, will occupy nearly a full block of ground.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., February 21, 1911, and publicly opened immediately thereafter, to furnish at the navy yard, Mare Island, Cal., a quantity of naval supplies, as follows: Sch. 3290: Naval bronze. Sch. 3292: Hardware and tools. Sch. 3293: Rod and sheet brass, sheet copper, brass pipe, ingot tin. Sch. 3294: Coke, composition unions, and pipe fittings. Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office, San Francisco, Cal., or to the Bureau, T. J. Cowie, Paymaster General, U. S. N.

One of the most successful automobile shows ever held was that of the licensed manufacturers at Madison Square Garden, New York City, January 6-21, 1911. This show was in two parts, the first being an exhibition of pleasure cars of all descriptions and the second was given up to the exhibition of commercial trucks. One of the most striking features of this portion of the show was the high state of development to which the commercial truck has been brought. Judging from the variety and character of vehicles shown, from the small single-cylinder tricycle delivery truck up to the ten-ton freight truck, it would seem that the knell of doom of the business horse in large cities had been sounded and it will be only a question of a short time before the only horses seen on the streets will be the sleek, carefully groomed and well-fed animals of pleasure.

The Connecticut Dynamo and Motor Company, which originated and for 18 years has manufactured the celebrated line of plating dynamos and motors formerly marketed by the Zucker & Levett & Loeb Company, has been reorganized with Donald McDermid, president, and Gerald Hanney, secretary and treasurer. The company's works have been moved from New York to Irvington, N. J. With Mr. McDermid, who has always held the leading interest in the company, giving all his time to its affairs, and Mr. Hanney, who has long been connected with the metal trade as treasurer of the Oscar Barnett Foundry Company, Irvington, N. J., and with improved manufacturing and shipping facilities, the prospects for the company's future are better than ever before. They request that platers in need of electrical equipment communicate with them at their new address.

SUPPLY HOUSE ANNOUNCEMENT.

At a recent meeting of the board of directors of the Detroit Foundry Supply Company of Detroit, Mich., manufacturers of foundry supplies and equipment, and polishers' and platers' supplies, W. Bruce Howard, vice-president, was elected president, to succeed E. J. Woodison, recently resigned. Merril Z. Fox, formerly associated with the Hill & Griffith Company, Cincinnati, was elected vice-president. R. S. Ray was re-elected secretary and treasurer. The Detroit Foundry Supply Company also announce that J. H. Lyle will represent the firm in Illinois, Wisconsin and Iowa, and H. E. Moyer in Indiana, Ohio and Canada. These representatives have had a wide experience in the foundry and platers' supplies trade, and have an extensive acquaintance among the manufacturers in their respective territories. The Detroit Foundry Supply Company wishes to thank their many friends for favors shown them in the past, and state that its business is going on the same as ever, even better, and it asks for their continued patronage.

INCREASE OF CAPITAL STOCK

The capital stock of the Columbian Brass Foundry, Freeport, N. Y., has been increased from $20,000 to $50,000.

FIRES

Fire recently destroyed the thaw house of the Federal Lead Company, Federal, Illinois, causing an estimated use of $15,000.

The Great Lakes Manufacturing Company, manufacturers of hardware specialties, North Chicago, Ill., suffered a loss of $15,000 by fire on Jan. 4. They will rebuild at once, and expect to install a polishing and nickel-plating plant.

The plant of the Gothberg Manufacturing Company, manufacturers of metal goods, 110 Duane street, New York, was completely destroyed by fire two weeks ago. A temporary office has been established at 172 Duane street.

PRINTED MATTER

METALS.—The Statistical Review of the domestic and foreign metal markets, being the annual statistical report of the New York Metal Exchange, compiled by C. Mayer, secretary, has been issued. The report covers 24 pages and gives a complete resume of the production and price range of all the principal metals of the world for 1910.

FOUNDRY SUPPLIES.—Frederic B. Stevens, Detroit, Mich., has issued a three-leaf folder, describing his extensive line of foundry supplies; among these are molders' shovels, salamander stoves, flax swabs for tinning purposes, bench rammers, Stevens' East India plumbago, molders' bellows, hand ladle bowls, and Stevens' carbon blacking.

AIR BRUSH.—The F. J. Lederer Company, manufacturers of the Buffalo Air Brush, give a very complete description of their air brush in a small booklet just issued. The field of usefulness for an air brush of this character is rehearsed and a great many points of superiority of this brush over others touched upon at some length. Copies of this booklet "K" may be obtained upon request.

LACQUERS.—The G. J. Nikolas Company have issued a handsome 35-page booklet filled with valuable and interesting matter concerning the famous Nikolas lacquers. These lacquers include all the various types used in the manufacture of metal articles of all descriptions and the work should be in the hands of every one interested in lacquers, whether manager, buyer or operator. Copies of the booklet will be sent upon application to the G. J. Nikolas Company, 1229 W. Van Buren street, Chicago.

FURNACES.—The Rockwell Furnace Company, 26 Cortlandt street, New York, have issued a four-page Bulletin "R," giving cuts and description of their combination tool room furnace, which is used for accurately heat-treating small tools, etc., for annealing, hardening, tempering and forging. This tool is intended for use with gas fuel only and can be used as an oven, muffle, cylindrical, lead hardening or oil or sand tempering furnace, and the floor space required is so small, being only 16x16 inches, that the machine can always be put in convenient places.

MELTING FURNACES.—Catalogue No. 12 has been issued by the W. S. Rockwell Company, 50 Church street, New York. This catalogue gives a full description of the Rockwell stationary crucible melting furnace, designed for the melting of aluminum, brass, copper, bronze, silver, gold, nickel, monel metal, etc., and is fully protected by patents. This furnace was described in

THE METAL INDUSTRY December, 1909. The furnace operates with oil or gas fuel and is built in sizes that will accommodate crucibles from No. 20 to No. 100, and even larger sizes will be built to order.

LACQUERS.—The Durlacque Manufacturing Company, makers of fine lacquers, bronzing liquids and bronze protector for brass, copper, steel, silver, oxidized iron and all other uses, 2322 Olive street, St. Louis, Mo., have issued a small booklet giving a description of their celebrated line of fine lacquers. Included among these are the C. B. S. 4, the ideal lacquer; diamond lacquer; amberite lacquer; K. C. 3, which is a water dip lacquer of exceedingly good quality; tin lacquers in all standard colors; waterproof lamp lacquers; and frosting lacquers and thinners. Catalogue will be sent upon request.

TIN SUBSTITUTE.—The Bassite Smelting & Manufacturing Company, manufacturers of Bassite, the substitute for tin, of Cincinnati, Ohio, give some very interesting data relating to this material in a four-page folder, just issued. For purposes of comparison the Bassite company state that there is an actual saving per thousand pounds in using Bassite in place of tin of $160 and that Bassite will give all the requirements of tin in a casting with the exception of extreme rigidity and stiffness, but this feature is said to be not essential in at least 75 per cent. of the brass work manufactured. While, if a greater rigidity is desired some tin may be added. The test of finished and unfinished bars of brass, in which Bassite has been used, show some very flattering results in favor of the use of Bassite.

AD NEWS

The Detroit Metal Spinning Company, Detroit, Mich., have a card in this issue setting forth their facilities for doing sheet metal drawing, stamping and spinning in copper, brass and steel.

A. Klipstein & Co., 129 Pearl street, New York, solicit inquiries for zinc dust, caustic potash, sal ammoniac, prussiate of soda and potash, zinc ammonium chloride for galvanizing, barium chloride and other chemicals.

The Chadwick-Boston Lead Company, 162 Congress street, Boston, Mass., announce that they furnish lead-lined tanks made of the highest grade chemical lead with burned seams. Pamphlet C-B gives further particulars.

The Alfred Spice Process, 250 North Fifth street, Philadelphia, Pa., have increased the space in which they advertise A. S. P. Soldering Fluid, which they claim replaces all other soldering fluxes, rosin, etc., to advantage.

The Bassite Smelting & Refining Company, Cincinnati and Milford, O., are taking advantage of the prevailing high price of tin to point out to foundrymen the saving that can be affected by the use of Bassite, a substitute for tin.

Benjamin Middleditch, Detroit, Mich., is advertising his tumbling barrels, sprue cutters and other brass foundry and finishing machinery, such as flasks, match plates, polishing machines, all of which are fully described in his catalogue "T M I."

The Monarch Engineering & Manufacturing Company, 1200 American Building, Baltimore, Md., continue to point out to foundrymen the advantages of using the Steel-Harvey furnaces. They invite requests for their 1911 catalogue T M I 4.

The Klauder-Weldon Dyeing Machine Company, Amsterdam, N. Y., continue to feature the Oblique Plating Barrel, for which they control the patents. Interested concerns are invited to write to department "Q" for full information and a list of users.

The Buffalo Copper & Brass Company are now regularly advertising their copper and brass rolling mill, which is situated on the Military road at Hertel avenue, Buffalo, N. Y. This big mill is prepared to furnish almost anything required in the copper and brass line.

A. J. Corcoran, Inc., 1 John street, New York, advertise the Corcoran tanks, which are so built that they hold solutions and acids without being lined and without leaking. These tanks are fully described and the dimensions and capacity of various sizes are given in detail on request.

The Connecticut Dynamo & Motor Company, Irvington, N. J., manufacturers of plating dynamos, motors, polishing and grinding lathes and other equipment for platers and metal manufacturers, have a page advertisement in this issue, in which some of their products are illustrated.

The Cleveland Blow Pipe Manufacturing Company, 2096 West Third street, Cleveland, O., illustrate in their advertisement their vacuum hoods, dust collectors and blows, which when used result in clean shops, healthier conditions and lower insurance. Their circular M. I. is sent on request.

The Cupror Company, 50 Church street, New York, quote in their advertisement the opinion of a well-known foundryman who tried out "Cupror," the new metal, that "looks like gold and acts like steel," and who states that in his opinion it is the most wonderful metal in the non-ferrous field.

White & Brother, Inc., smelters and refiners, call attention to their unexcelled facilities for smelting brass and copper skimmings, grindings, buffings and sweepings. They will quote liberal terms on receipt of samples. Inquiries should be sent to White & Brother Dept. S., Station K., Philadelphia, Pa.

Charles F. L'Hommedieu & Sons Company, 24-26 South Clinton street, Chicago, Ill., have an advertisement relating to their new platers dynamos, and to their plating barrel, Number 9 polishing lathe and other specialties for platers and polishers. These are more fully treated in their catalogue T M I, sent for the asking.

The Standard Rolling Mills Inc., 363 Hudson avenue, Brooklyn, N. Y., are publishing a series of advertisements which present some interesting facts regarding their Britannia metal when used in place of brass, copper or German silver for spun, stamped or drawn metal goods. Their circular gives further information.

The American Smelting & Refining Company, Cincinnati, O., illustrate their large plant at Cincinnati in this issue. This concern manufacturers babbitt, solder, type metal, brass ingots, lead, zinc and tin, and deals in pig tin, pig lead, ingot copper, antimony and aluminum. Their specialties are phosphor tin, phosphor copper, silicon and manganese copper, metallic silicon and double refined spelter.

The Eureka Pneumatic Spray Company, 276 Spring street, New York, have issued a pamphlet entitled "Progress vs. Prejudice," which discusses the advantages of using sprayers for applying lacquers, enamel, paint, etc. This company announce that they have recently worked out methods of securing with Eureka lacquer enamels many finishes that heretofore have been impossible to produce except by electro-plating, such as verde anitques, sea air green, etc. They have worked out methods and formulas and purchasers are instructed in these methods when they purchase Eureka outfits.

CATALOGUE EXHIBIT

An exhibition of every kind of catalogues may be seen at THE METAL INDUSTRY office, 99 John street, New York. THE METAL INDUSTRY is prepared to do all of the work necessary for the making of catalogues, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies, and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds. Address THE METAL INDUSTRY, 99 John street, New York.

METAL MARKET REVIEW

NEW YORK, February 14, 1911.

COPPER.

The trend of the Standard Copper market in London during the early part of the month was toward a lower basis of price. Opening at £56 5s., prices advanced £56 15s. When the American figures were published prices sagged off gradually to £53 15s., a decline of £3 per ton from the opening. Later prices reacted about £1 from the lowest, and closed at £54 17s. 6d.

In the New York market prices began to sag about the middle of January, and from a 13 per cent. market for Lake prices declined nearly ½ cent per pound. Later, with the slight advance in the London market and the better outlook generally in the iron and steel trade, the market here became firmer and prices advanced about ¼ cent per pound from the lowest, closing to-day at about the same price as a month ago—Lake 12¾, Electrolytic 12½, Casting 12.35.

The exports for the month of January were fairly heavy, 29,257 tons against 26,699 tons same period in 1910. The total imports for the year 1910 were 153,000 tons, against 145,000 tons in 1909. In our review for the year 1910 we estimated the imports as 150,000 tons.

The figures published February 8 by the Copper Producers' Association show an increase in the stocks of over 20,000,000 pounds during the month of January. The production for the month is the smallest since February last year and the total deliveries for the month are the smallest since these figures have been published. The large increase in the stocks has come as a surprise to the trade and prices are likely to suffer.

PIG TIN.

The London market has acted exactly as outlined in our report of January 16th. The London price of spot tin opened at £176 10s., and prices were rushed to £203 15s.; later prices declined to £197 at the close.

In the New York market prices have followed the London advances, reaching 44½ cents per pound from 39½ at the opening of the month. Later prices declined on the break in London of nearly £7 per ton, and at the close of the month tin is selling at around 43¼ cents, showing a net advance for the month of over 4 cents per pound.

Consumption for the month of January was 3,200 tons against 3,500 tons last year. The shipments from the Straits were 4,320 tons against 5,860 tons in January, 1910.

LEAD.

The foreign lead market has declined about 5s. during the month, closing at £12 16s. 3d.

In the New York market prices have held steady at from 4.45 to 4.50 New York, closing at 4.45 New York for carload lots. In St. Louis prices have ruled at around 4.30 to 4.32½ East St. Louis delivery.

SPELTER.

The foreign spelter market has sagged off about 10s. per ton during the month, closing at £23 10s. The foreign syndicate has got together again, and prices are likely to be firmly held.

The New York market has ranged from around 5½ to 5.65, closing at 5.60 New York per carload lots. In the St. Louis market prices are steady at the close, 5¼ for carload lots.

ALUMINUM.

The market is easier again, and prices are fully ½ cent per pound lower than a month ago. Spot and future shipments are quoted at 21½ cents for round lots, small lots at 22 to 22¼ for ingots 98.99 per cent. pure.

ANTIMONY.

There has been no change in the price of antimony. Cookson's is quoted at 8¼ cents, Hallett's at 7¾ and Chinese at 7¼ cents.

SILVER.

Prices of silver show a decline of about 2 cents per ounce for the month, closing at 52¾ cents. In London silver opened at 25½d., and closed at 24⅜d.

QUICKSILVER.

The market is firmer and prices have advanced $4 per flask. Wholesale quotations today $46 against $42 last month. Jobbing lots are quotable at $46.50 to $47.

PLATINUM.

The market is inclined to be easier, but prices are nominally about the same as a month ago—Hard at $41, ordinary refined at $38.50.

SHEET METALS.

Prices are unchanged, sheet copper 18 cents, wire 14 cents, high sheet brass 14¼, seamless copper tubing 21 cents, seamless brass tubing 18 cents.

OLD METALS.

There has been a good demand for export, but the home trade is very dull, and prices are about the same as a month ago.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

	February 8, 1911. Pounds.
Stocks of marketable copper of all kinds on hand at all points in the United States, January 1, 1911.....	122,030,195
Production of marketable copper in the United States from all domestic and foreign sources during January, 1911.....	115,696,591
	237,726,786
Deliveries:	
For domestic consumption..... 42,078,557	
For export 53,208,739	
	95,287,296
Stocks of marketable copper of all kinds on hand at all points in the United States, February 1, 1911	142,439,490
Stocks increased during the month of January.....	20,409,295

JANUARY MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	13.00	12.60	12.70
Electrolytic	12.75	12.25	12.55
Casting	12.40	12.20	12.35
TIN	44.50	39.35	41.45
LEAD	4.50	4.50	4.50
SPELTER	5.65	5.55	5.60
ANTIMONY (Hallett's).....	7.75	7.50	7.70
SILVER	.55	.52¾	53.65

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.

1910.—Average for year 13.13½. 1911.—January, 12⅞.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Metal Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the back advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds. See Want Ad. pages.

Metal Prices, February 14, 1911

NEW METALS.

	Price per lb. Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	12.75
Electrolytic, carload lots	12.50
Casting, carload lots	12.40
TIN—Duty Free.	
Straits of Malacca, carload lots	41.00
LEAD—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.50
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	5.60
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. ped lb.	
Small lots	28.00
100 lb. lots	25.00
Ton lots	21.75
ANTIMONY—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	8.25
Hallett's cask lots	7.75
Other cask lots	7.15
NICKEL—Duty Ingot, 6c. per lb. Sheet, strips and wire 35% ad valorem.	
Shot, Plaquettes, Ingots, Blocks, according to quantity	.43 to .60
MANGANESE METAL—Duty 20%	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25% ad valorem (100 lb. lots)	1.50
BISMUTH—Duty free	2.10
CADMIUM—Duty free	.80
	Price per oz.
GOLD—Duty free	$20.67
SILVER, Duty free	.52¾
PATINUM—Duty free	39.00
QUICKSILVER—Duty 7c. per lb. Price per pound .65 to	.66

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
11.00 to 11.25	Heavy Cut Copper	12.00 to 12.25
10.50 to 10.75	Copper Wire	11.50 to 11.75
9.75 to 10.00	Light Copper	10.75 to 11.00
9.25 to 9.50	Heavy Mach. Comp.	10.50 to 10.75
7.00 to 7.25	Heavy Brass	8.00 to 8.25
5.50 to 5.75	Light Brass	6.75 to 7.00
7.00 to 7.25	No. 1 Yellow Brass Turnings	8.00 to 8.25
8.00 to 8.25	No. 1 Comp. Turnings	9.00 to 9.25
3.90 to 4.00	Heavy Lead	—— to 4.25
3.75 to 3.90	Zinc Scrap	—— to 4.25
5.00 to 5.50	Scrap Aluminum, turnings	5.00 to 6.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 18.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
25.00 to 27.00	Old Nickel	28.00 to 30.00

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% to 20%.....according to quantity	28 to 35
Silicon Copper, 30% guaranteed... " "	38
Phosphor Copper, 5% ..... " "	19 to 21
Phosphor Copper, 10% to 15%, guaranteed ..... " "	28 to 30
Manganese Copper, 30% ..... " "	30 to 35
Phosphor Tin ..... " "	34 to 36
Brass Ingot, Yellow..... " "	8½ to 9½
Brass Ingot, Red ..... " "	11 to 12½
Bronze Ingot ..... " "	10 to 11
Manganese Bronze ..... " "	17 to 19
Phosphor Bronze ..... " "	13 to 16
Casting Aluminum Alloys..... " "	29 to 35

PHOSPHORUS—Duty 18c. per lb.
According to quantity ..... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 18 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7⅝ to 9⅛ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7⅝ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over.....Base Price.
(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

	Cents per lb.
ZINC—Duty, sheet, 1⅝c. per lb.	
Carload lots, standard sizes and gauges, at mill	7.50 less 8%
Casks	8.00
Open casks	8.50

Metal Prices, February 14, 1911

PRICES ON BRASS MATERIAL—MILL SHIPMENTS,

In effect Jan. 30, 1911, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.13¼	$0.14⅞	$0.15⅝
Wire	.13¼	.14⅞	.15⅝
Rod	.13¼	.15⅜	.16⅛
Brazed tubing	.18⅜	——	.20¼
Open seam tubing	.16⅜	——	.18¼
Angles and channels, plain	.16⅜	——	.18¼

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet	—Extra spring drawing and spinning brass...	½c.	per	lb.	net advance
"	—Best spring, drawing and spinning brass....	1½c.	"	"	"
Wire	—Extra spring and brazing wire.....	½c.	"	"	"
"	—Best spring and brazing wire.....	1c.	"	"	"

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14¼	$0.15⅞	$0.17⅝
Wire	.14¼	.15⅞	.18⅜
Rod	.14¼	.16⅝	.19⅜
Brazed tubing	.19⅜	——	.21½
Open seam tubing	.17⅜	——	.19½
Angles and channels, plain	.17⅝	——	.19½

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet	—Extra spring drawing and spinning brass...	½c.	per	lb.	net advance
"	—Best spring, drawing and spinning brass....	1½c.	"	"	"
Wire	—Extra spring and brazing wire.....	½c.	"	"	"
"	—Best spring and brazing wire.....	1c.	"	"	"

BARE COPPER WIRE—CARLOAD LOTS.

14c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	18½c.	per	lb. base
100 lbs. to 300 lbs. in one order	19c.	"	"
Less than 100 lbs. in one order	20½c.	"	"

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 21c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1⅛ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 55 and 5%.

PRICES FOR MUNTZ'S METAL AND TOBIN BRONZE.

Muntz's or Yellow Metal Sheathing (14" x 48")		14c.	net base
" " " Rectangular sheets other than Sheathing		16c.	" "
" " " Rod		14c.	" "
Tobin Bronze Rod		16c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 22¼c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than..... and including.....	8in. 12in.	6in. 14in.	14in. 16in.	16in. 18in.	18in. 20in.	20in. 24in.	24in. 30in.	30in. 36in.	36in. 40in.
		in coils.								
No. 13 and heavier		34	34	36	36	36	36	39	39	39
" 14		34	34	36	36	36	36	39	39	39
" 15		34	34	36	36	36	36	39	39	39
" 16		34	34	36	36	36	36	39	39	39
" 17		34	34	36	36	36	36	39	39	39
" 18		34	34	36	36	36	36	39	39	42
" 19		34	34	36	36	36	36	39	40	43
" 20		34	36	36	36	36	38	41	42	44
" 21		34	38	38	38	38	40	43	44	50
" 22		34	38	38	38	40	40	43	47	51
" 23		34	38	38	38	40	40	43	49	52
" 24		34	38	40	42	42	42	45	51	54
" 25		36	39	41	43	43	43	46	53	57
" 26		36	39	42	46	46	46	51	55	61
" 27		36	40	44	48	48	49	54	58	64
" 28		36	40	46	48	49	49	56	62	67
" 29		38	41	48	50	52	52	61	67	72
" 30		38	42	50	52	56	62	60	72	77
" 31		43	47	55	58	63	71	74	77	83
" 32		45	49	57	61	69	77	91	90	95
" 33		47	51	60	65	73	84	91	100	110
" 34		50	55	62	70	78	91	103	110	120
" 35		..	65	70	80	90	100	115	125	..
" 36		..	80	90	100	115	120	135	..	..
" 37		..	104	114	129	144	159	174	..	..
" 38		..	124	139	154	169	184	204	..	..
" 39		..	144	164	184	204	224	..	..	..
" 40		..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	37
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent.	to No.	19,	B. & S.	Gauge,	inclusive..... $0.60
6 "	"	19,	"	"	" ..... .70
9 "	"	19,	"	"	" ..... .85
12 "	"	19,	"	"	" 1.00
15 "	"	19,	"	"	" 1.15
16 "	"	19,	"	"	" 1.20
18 "	"	19,	"	"	" 1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.

ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

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SHEET TUBING
EXTRUDED SHAPES
ROD RIVETS WIRE
ELECTRICAL CONDUCTORS

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INGOT METAL scientifically prepared under chemical supervision has been found by the largest consumers to be equivalent in quality to the use of new metals. Such Ingot will save money, save loss and save time. Ingot Metal made by rule of thumb methods, from inferior scrap is no better than junk.

Our Ingots are prepared by the most modern scientific methods and are furnished subject to specifications.

We solicit your inquiries. Address Dept. I.

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PHILADELPHIA, PA. BIRMINGHAM, ALA.

Ingot
Sheet

SPECIAL NICKEL ALLOY

Tube
Rod

Non-Corrosive *Something New* *High Tensile Strength*

Same appearance as Nickel Plate when polished. Will not wear through or peel.
OF SPECIAL INTEREST to Manufacturers of Automobiles, Lamps, Plumbing Goods, Surgical Instruments, Etc.

EVERYTHING FOR PLATING AND POLISHING

H. W. LAMPORT & COMPANY

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Die Castings

For all classes of work we can supply Finished Parts more ***accurate, uniform*** and ***cheaper*** than you can produce them by machinery. Estimates submitted on request.

Finished Parts Mfg. Co.
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CHROMAX BRONZE

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The best bronze for bearings, gears, etc. Possesses a very oily nature, acid proof, non-corrosive, and being of a oily nature it does not have the same tendency to cut shaft when heated.
All kinds of brass and aluminum castings. Brazing solder of all kinds.

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1891
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Allan Bronzes from 15% to 48% lead, the Homogeniety of which cannot be duplicated. We guarantee our Allan No. 2 Bronze Copper 66%, Lead 25%, Tin 9% = (13 parts Tin to 87 parts Copper in the mix) to withstand the most severe mill service.

When ordering lead-copper-tin alloys, specify that sand cast ingots are wanted. They need no microscopic examination to detect segregation. Allan Bronze ingots are cast in green sand, not in chilled moulds.

492 Greenwich St. New York City

The FIRST Platinum Works in the United States
FOUNDED 1842

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For any purpose

CHEMICAL APPARATUS
CRUCIBLES
ELECTRODES DISHES
SHEET
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FOIL

Platinum Alloys, Salts and Solutions

J. BISHOP & CO. PLATINUM WORKS

Refiners and Manufacturers
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MALVERN, PA. U. S. A.

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of Metal Goods, such as hollow-ware, brush, comb and mirror backs; trays, novelties, badges, medals, etc., can find many profitable uses for our

BRITANNIA METAL

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The new metal that looks like gold and wears like steel. *Absolutely won't corrode.* Resists the action of the atmosphere, salt air and salt water. *Color and lustre permanent.* Great strength, toughness and ductility. *The easiest metal to work known.* Can be had either soft or of hard spring temper. For fittings of all kinds. *No lacquer required. Easily cleaned with soap and water.* Some of its principal uses are: for jewelry, bedsteads, automobile fittings, ship's fittings, building hardware, furniture trimmings, railroad car fittings, lamps, lavatory fittings, chandeliers, etc. In ingots, sheet, wire, tubing and rods.

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Tel. 8748 Cortlandt
Cables, Pamphlet, New York

50 Church Street, New York

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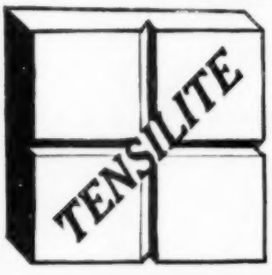

A purifier and scavenger for all metals. Will eliminate iron and other impurities, prevent dross and oxidation; makes the metal more dense and homogeneous. Made in 1 lb. Briquets, making it easy to handle and saves waste. FREE TRIAL OFFER. Will send 100 lbs. on approval for $10.00, f. o. b., Cleveland. If it does not improve your metal, no charge will be made.

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LOOK AT TIN!!

NOW is the time to order
100 pounds of

BASSITE

and find out just what it will do for you toward saving 40% of the price of tin. You have the strength and quality test reports, or we will send them on application.

BUT ORDER NOW

The Bassite Smelting & Mfg. Co., Inc.

Cincinnati and Milford, Ohio, U.S.A.

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ALUMINUM SOLDER

IS THE ONLY REAL RELIABLE
ALUMINUM SOLDER

A SAMPLE ORDER WILL PROVE IT

JANNEY, STEINMETZ & CO.

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Aluminum Solder **No Flux**

Mass. Institute of Technology, test 11,090 lbs. per sq. inch at soldered joint

WE HAVE THE STRENGTH

$100 REWARD

FOR ANY BROKEN PIECE OF ALUMINUM WE FAIL TO REPAIR SATISFACTORILY WITH OUR SOLDER

Solder $3.00 per lb. Sample Sticks $1.00

We have repaired tons of Aluminum

ALUMINUM SOLDER CO. OF BOSTON, Inc.

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AGENTS WANTED

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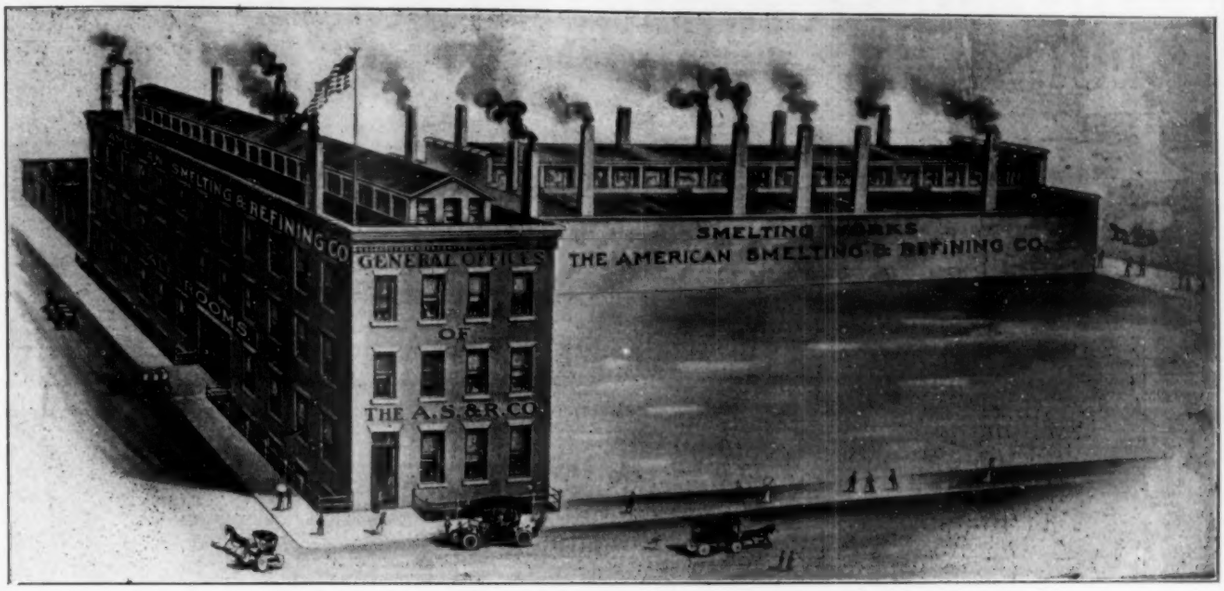
134 W. 49th St., N.Y.



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Manufacturers of **Babbitt, Solder, Type Metal, Brass Ingots, Lead, Zinc and Tin.**
Dealers in **Pig Tin, Pig Lead, Ingot Copper, Antimony and Aluminum.**

Our Specialties are Phosphor Tin, Phosphor Copper, Silicon and Manganese Copper, Metallic Silicon, Double Refined Spelter (Branded Kansas Select)

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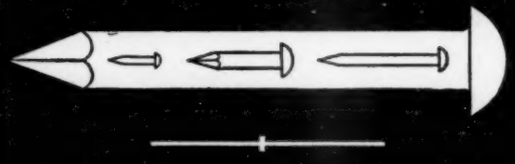

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GERMAN SILVER, ALUMINUM, ETC.
AND
PLATED IN ANY FINISH
HAVE MADE THEM SINCE 1850

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CLAY & OAKLAND STREETS,
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NO ACID NO FUMES NO RUST

Saves the Health of the Metal Worker

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SOLDERING FLUID
The One Great Advance in the Soldering Industry
MANUFACTURED BY
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MANUFACTURING CHEMISTS
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Single gallons 80 cents at any jobber's. Quotations on quantity.
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Ingots—
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SOLE AGENTS FOR ALL FRENCH PRODUCERS

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Pure Aluminum in Sheets and Foil to thinness of $\frac{1}{1000}$ of an inch. Aluminum in Ingots, Sheets, Rods, Wire and Tubing. Aluminum Solder and Rivets. Platers' Silver and Battery Plate 999 Fine. Platers' Brass, Oreide and German Silver.

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Bronze Liquid for Mixing the Powder
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SEAMLESS DRAWN BRASS AND COPPER TUBING
BRASS (SHEET, ROD, WIRE) COPPER (SHEET, ROD, WIRE)
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At Waterbury

NON-CORROSIVE FINEST QUALITY
Copper and Yellow
(MUNTZ) METAL
NAVAL BRASS
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PLATES, SHEETS, BOLTS, BARS, RODS, NAILS, TACKS, ETC.
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In Sheets, Plates, Rolls
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"BRIDGEPORT" BRONZE ROD
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For Trolley, Telephone and Telegraph Lines
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in Sheets and Rolls
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(for Coach Lamps)
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SEYMOUR, CONN.
German Silver
Brass, Copper and Bronze in Sheets, Wire, Rods and Tubes
COPPER AND NICKEL ANODES
Phosphor Bronze

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WATERBURY, CONN.
Manufacturers of
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TUBING FOR ELECTRICAL PURPOSES
Odd and Special Shapes, and Small Tubing a Specialty
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BOURDON STEAM GAUGE SPRINGS
All Sizes from 8 to 36, B. & S. Gauge.

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GERMAN SILVER
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Sheets, Rods, Wire, Ingots, Castings, Jewelers' Bars and Alloys.
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in Brass, Bronze, Copper, Steel, Aluminum, German Silver and Special Alloys.
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From 4 in. Diameter to 1-64 in.
Finished Bright, Smooth and Accurate to 1-1000 Ins. Inside and Out
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Special Sizes of Zinc to order. Rolled Battery Plates. Selected Plates for Etchers' and Lithographers' use. Selected Sheets for Paper and Card Makers' use. Stove and Washboard Blanks.

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THE ORIGINAL BRAND OF PURE SPELTER
Indispensable in the manufacture of
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High Grade Spelter
If you want highest efficiency in Manganese Bronze and Special Alloys use
GOLDEN ROD BRAND
Manufacturers also of
BRAZING SOLDER
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HIGH GRADE SPELTER
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IN COILS FOR DRAWING and STAMPING
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Manufacturers of

Pig and Bar Lead, Spelter, Babbitt Metals Linotype, Stereotype, Monotype and Electrotype Metal, Yellow Composition and Phosphor Ingots

Dealers in New and Old Metals, and the Largest Buyers of Zinc Dross, Skimmings, Sal Skimmings, Scrap Zinc and Aluminum

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241 and 243 Front Street, New York

OFFER FOR SALE:

HEAVY COPPER AND WIRE, Ready for the Crucible
COMPOSITION, Carefully Selected
HEAVY YELLOW BRASS, Free from Iron
OLD METALS GENERALLY

THEODORE HOFELLER & CO.

BUFFALO, N. Y.

Our Specialties

Heavy Copper and Copper Wire Cut in Crucible Shape

Number One Red Brass Scrap

Heavy Yellow Brass Scrap

SMELTERS OF

Skimmings, Grindings, Buffings, Sweepings } **BRASS** { Skimmings, Grindings, Buffings, Sweepings

WHITE & BRO., Inc.

Station K, Philadelphia, Pa.

Eagle Smelting & Refining Works

734-740 EAST 14th STREET, NEW YORK CITY

Manufacturers of

Solder, Type Metals, Babbitt Metals and White Metal Alloys

Smelters of Drosses of all Kinds — Dealers in New and Old Metals

MAGNESIUM METAL

is lighter than Aluminum and thus offers the means of producing strong and lightest weight Castings. Magnesium is also a good deoxidizing agent for brass foundry work.

NOTE: Always Specify "LEAVITT'S" MAGNESIUM

C. W. LEAVITT & CO.

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Albert A. Moers

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Write me to-day for attractive prices in large and small quantities. Only 98 per cent. and 99 per cent. handled. Can be used for all purposes. 250 tons per month.

Telephone, Bridge 1519 — Lock Box 163

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Chemical Department

EAST ST. LOUIS, ILLS.

Manufacturers of Soldering Flux, Commercial Salts, and Chloride of Zinc in Fused, Granulated and Liquid form

The Granulated Chloride of Zinc is indispensable, as a flux, to Brass, Copper and Aluminum Founders

Put up in 50 and 100 lbs. iron packages

Price 10 cents per pound delivered in the United States

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Lake, Electrolytic and Casting Ingot Copper

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BUYERS AND SELLERS OF NEW AND OLD METALS.

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Wm. F. Renziehausen Co.

Gold and Silver Refiners

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Full value paid for any material containing Gold, Silver and Platinum

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Let People Know You are in Business

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Detroit Metal Spinning Co.

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See Pages 50, 51, 52, 53

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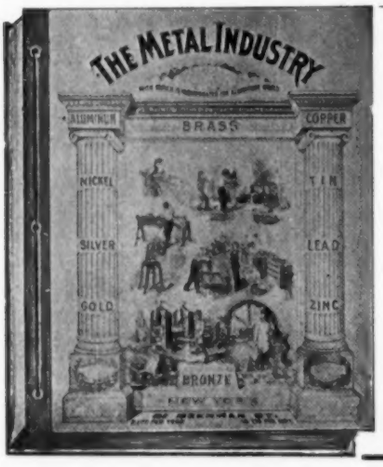

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FOR SALE

One Automatic self emptying Galvanizing and Plating Barrel and Outfit, *which we purchased outright—not under royalty,* made by the U. S. Electro Galvanizing Co., and as illustrated on front page of December number of The Metal Industry.

Will sell at one-third cost. Very little used. Also solution for the outfit.

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The exclusive rights to manufacture and sell a patented machine that greatly reduces foundry costs. This is an established business; the machines are in use in a number of prominent foundries, and there is an excellent opportunity for extension. Address B. R., care "The Metal Industry."

We have a stock of ¾ in. iron lined brazed brass tube in 46-in. lengths and 760 lbs. ½ in. No. 20 Annealed Brass Tube in 6 ft. 6 in. lengths, also assortment of No. 18 Gauge Brass Tube from ¾ in. to 2 in. Want to sell and invite correspondence. THE ADAMS & WESTLAKE COMPANY, CHICAGO, ILL.

FOR SALE—The PATENT RIGHTS of a packless steam valve which has been demonstrated to be the only practical packless valve on the market. Address J. O. EBERHARD, JR., BULLETIN BUILDING, PHILADELPHIA, PA.

FOR SALE OR RENT

METALS, MACHINERY AND SUPPLIES Cont'd.

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Ingot Brass: Spelter: Pig Lead

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FOR SALE—One 32-inch 300-lb. capacity SCHWARTZ FURNACE in A-1 condition. Address PENBERTHY INJECTOR COMPANY, Detroit, Mich.

FOR SALE—MOLDING MACHINES, second-hand, in good condition. 1 Mumford air molding machine for 12 x 14-in. flask; air power to squeeze; air power to draw patterns with 5-in. lift. 1 Mumford air squeeze with 26 x 18-in. table on same. Address SPEAKMAN SUPPLY AND PIPE CO., Wilmington, Del.

J. P. FANNING, machinist, 678 Jefferson avenue, Brooklyn, N. Y.—Maker of Moulds for Casting Solder, Babbitt Metal, Bar Lead, etc. We also manufacture small work. Write for particulars.

FOR SALE—Complete file, New Series, METAL INDUSTRY to date. Make offer. SHEPARD, 77 E. 3rd So., Salt Lake City, Utah.

PLANTS

FOR SALE OR LEASE—BRASS AND ALUMINUM FOUNDRY in Indianapolis, Ind. Thoroughly modern in equipment and appliances. Did a business in its last year of nearly $200,000.00. Second largest automobile center in United States. Nearly thirty auto factories in city and vicinity. Great quantities of brass and aluminum castings required here and within a radius of one hundred miles. Present owner engaged in other business requiring his time. Address F. E. JANIS, care F. E. JANIS COAL & GRAIN COMPANY, INDIANAPOLIS, IND.

FOR SALE.—BRASS FOUNDRY in Brooklyn, N. Y., fully equipped and running at the present time. Good line of paying business. Owner engaged in other business requiring his time. Address J. W. C., care THE METAL INDUSTRY.

FOR SALE—PLATING and POLISHING SHOP, the only one in city. At the present time doing good business. Reason for selling, other business. Cheap to quick buyer. Address PLATING SHOP, care THE METAL INDUSTRY.

FOR SALE—A fully equipped ELECTRO-PLATING PLANT in large western city. Established four years. Profits from $175 to $200 per month. Price $2,000 if taken at once. Terms $1,200 down, balance to suit buyer. Reason for selling, death of owner. Address H. B. B., care THE METAL INDUSTRY.

FOR SALE—ELECTRO-PLATING PLANT doing a good business in the heart of the city of Boston. Good reasons for selling. WINTHROP PLATING COMPANY, 34 Beach street, Boston, Mass.

FOR SALE—Good paying BRASS MANUFACTURING ORNAMENTAL METAL and PLATING WORKS; fully equipped; long lease; cheap rent; established thirty years; wants to sell on account of sickness; will sacrifice for $9,000, at least half cash. Address BOX 1, care THE METAL INDUSTRY.

FOR RENT OR SALE—Building suitable for crucible manufactory, containing eight kilns and 50,000 square feet of floor space. Write P. O. BOX 27, Albany, N. Y.

WANTED

METALS, MACHINERY AND SUPPLIES

WANTED—Second-hand SCHWARTZ BRASS MELTING FURNACE, adapted to Sturtevant fan equipment State condition, accessions, size, and lowest price f. o. b. cars. Address SCHWARTZ, care THE METAL INDUSTRY.

WANTED—A 10 h. p. UPRIGHT BOILER. Must be in good condition and at low cost. Address S-1, care THE METAL INDUSTRY.

WANTED—Second-hand 6 or 8 h. p. horizontal engine and boiler. State what make, condition and price. Address HORIZONTAL, care THE METAL INDUSTRY.

BUSINESS OPPORTUNITY

HAVE ALL METAL flying machine and full line of aeronautical supplies. All will be covered by patent rights. Association with interested party or concern who will finance desired. J. FILLMORE COX, Con. & P. Mechanical Engineer, Bayonne, N. J.

TRADE WANTS

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INQUIRIES

Inquiries received by THE METAL INDUSTRY for Metals, Machinery and Supplies. Further particulars may be obtained by addressing the inquiry number, care THE METAL INDUSTRY. No charge for inserting these inquiries.

Inquiry No. 258—We would like to correspond with the manufacturers of fine screens.

Inquiry No. 259—We would like to correspond with the manufacturers of tampico brush wheels.

Inquiry No. 260—We would like to correspond with firms manufacturing mills for rolling tea lead.

Inquiry No. 261—We would like to correspond with firms manufacturing three-way core cocks and a general line of ground key goods.

Inquiry No. 262—We would like to correspond with firms who make pins, belt buckles and novelty jewelry.

Inquiry No. 263—We would like to correspond with firms having large presses upon which could be stamped coffee urn lids of 24 inches diameter.

Inquiry No. 264—We would like to correspond with firms selling lead foil for etching work.

Inquiry No. 265—We would like to correspond with the manufacturers of buff wheels.

Inquiry No. 266—We would like to correspond with firms making "Nicolene," a new metal.

Inquiry No. 267—We would like to correspond with the manufacturers of blanks for knives, forks, spoons, etc.

Inquiry No. 268.—We would like to correspond with the manufacturers of Annealing Furnaces.

Inquiry No. 269.—We would like to correspond with the importers, manufacturers of source of supply where ¾" magnalium can be procured.

Inquiry No. 270.—We would like to correspond with firms that use scrap zinc. We have an accumulation of scrap zinc that we wish to sell.

SITUATIONS OPEN

EXECUTIVE

WANTED

Architectural Bronze and Iron Factory SUPERINTENDENT. Must have experience on large, high-grade contract handling and be capable of overseeing entire plant and manufacture from draughting room to erecting. Only first-class, energetic man desired. Salary will depend on ability to show results. For further particulars address A. A., care THE METAL INDUSTRY.

WANTED—Experienced SUPERINTENDENT for ORNAMENTAL IRON and BRONZE SHOP. Must understand estimating and have unusual executive ability. Give full particulars as to past experience and salary desired. Exceptional opportunity for right man. Address T. W. T., care THE METAL INDUSTRY.

WANTED—Young man about 25-30 years old to take charge of QUOTATION DEPARTMENT in office of MANUFACTURER of PLUMBERS' BRASS GOODS. Familiarity with costs is absolutely necessary. Give full particulars regarding experience, references, salary, etc. Replies treated confidentially. Address PLUMBERS' BRASS, care THE METAL INDUSTRY.

WANTED—A good SUPERINTENDENT; one capable of taking entire charge of a growing factory. One who understands FOUNDING, PLATING, POLISHING and MAKING preferred. Location, Los Angeles, Cal. Address CAPABLE SUPERINTENDENT, care THE METAL INDUSTRY.

PROFESSIONAL

WANTED—Competent experienced CHEMIST for laboratory work on Non-Ferrous metals, by a large manufacturing plant. Address R. S. U., care THE METAL INDUSTRY.

SALESMEN

WANTED—MIXED METAL SALESMAN. Must know solder and babbitt trade. Good opportunity for man who can make good. Answers strictly confidential. Address B-L, care THE METAL INDUSTRY.

WANTED—SALESMAN. A resident salesman wanted in Rochester, Buffalo, Cleveland, Toledo, Detroit, Chicago, Milwaukee and Denver to look after bronze, brass and aluminum castings. Must be first-class. Address NAULTY SMELTING & REFINING CO., LTD., 2616-18 Martha street, Philadelphia, Pa.

FOUNDERS AND ROLLERS

WANTED—A capable man to take charge of some gas furnaces, who has had some experience with heat treating of various grades of steel and iron. Address B. & CO., care THE METAL INDUSTRY.

WANTED—A good MOLDER for light YELLOW BRASS. We pay prevailing wages and can give a man steady employment. Location, Los Angeles, Cal. Address YELLOW BRASS, care THE METAL INDUSTRY.

WANTED—BRASS FOUNDRY WORKING FOREMAN, by concern making PLUMBERS' BRASS GOODS and HARDWARE, highest grade. Must understand melting and core making. State experience and salary. Location near Philadelphia. Address S. S. P., care THE METAL INDUSTRY.

SITUATIONS OPEN—Continued

BRASS FINISHER

WANTED—FOREMAN BRASS FINISHER to take charge of SCREW MACHINE and JIG-DRILLING DEPARTMENT in factory making CHANDELIERS and PARTS. Address CHANDELIER, care THE METAL INDUSTRY.

SHEET METAL WORKER

WANTED—FOREMAN for SHEET METAL DEPARTMENT. Well established automobile concern; for making fenders, tanks, radiators, etc. Excellent opportunity for first-class man. Address D-2, care THE METAL INDUSTRY.

PLATERS AND POLISHERS

WANTED—First class PLATER and POLISHER to take entire charge of job-shop in city near New York. Business ability essential. Address, stating your experience and salary expected. Address RESULTS, care THE METAL INDUSTRY.

WANTED—Good PLATERS familiar with the plating of silver, nickel, capper, brass, also GALVANIZING. Apply at our works, THE PATCHOGUE ELECTRO-PLATING WORKS, River avenue and Division street, Patchogue, Long Island, N. Y.

WANTED—COLORER; man thoroughly experienced in handling BELT BUCKLES and similar novelties. Must be capable of taking entire charge of room. Address, with full particulars, K. G., care THE METAL INDUSTRY.

WANTED—A PRACTICAL PLATER who thoroughly understands SILVER DEPOSIT business in all its branches. First-class opening for a competent man. With answers give full particulars, references, wages expected. Address D-3, care THE METAL INDUSTRY.

SITUATIONS WANTED

Advertisements Under This Heading 50 Cents Each Insertion.

EXECUTIVE

SITUATION WANTED—As EXECUTIVE, ORGANIZER, COSTS and BUYING EXPERT. Several years with one of the largest hardware manufacturers in the world. Educated at Yale University, 31 years old. Has personal acquaintance with a large proportion of the Eastern trade, particularly along practical lines. For full particulars address F-9, care THE METAL INDUSTRY.

SITUATION WANTED—As SUPERINTENDENT or GENERAL FOREMAN in a brass manufacturing establishment. Automobile, steam, and the general line of brass goods. Able to obtain results. Twenty years' experience. Address GENERAL FOREMAN, care THE METAL INDUSTRY.

SITUATION WANTED—By BOOKKEEPER and ACCOUNTANT. A bookkeeper of many years' experience desires a position. Thoroughly understands bookkeeping and accounting. First class reference. Address BOOKKEEPER, care THE METAL INDUSTRY.

SITUATION WANTED—As MANAGER or SUPERINTENDENT. Energetic, aggressive, experienced in manufacture of PLUMBERS' BRASS work, valves, etc. Can handle help and get the work out. Modern methods, interchangeable parts, technical education. Address S-6, care THE METAL INDUSTRY.

SITUATION WANTED—BRASS FOUNDRY SUPERINTENDENT or FOREMAN. Thoroughly experienced on ALUMINUM CASTINGS for automobiles, valve, pump and general jobbing lines. Thirty-two years old, temperate and a hustler. Well up on molding machines and mixing metals. Address 0-2, care THE METAL INDUSTRY.

SITUATION WANTED—Position as MANAGER or SUPERINTENDENT with concern manufacturing BRASS GOODS. Technical graduate, married, sober, industrious and energetic, 30 years old, experienced on PLUMBERS' BRASS GOODS, BUILDERS' HARDWARE, etc.; INTERCHANGEABLE PARTS, modern methods, executive, cost accountant. References. Address R., care THE METAL INDUSTRY.

SITUATION WANTED—By a BRASS WORKS MANAGER, in the Middle West preferred. Thoroughly understands the manufacture of BRASS and METAL GOODS and desires to connect with some manufacturing business, having capital to invest if the right business is secured. Address MANAGER, care THE METAL INDUSTRY.

PROFESSIONAL

SITUATION WANTED—A METALLURGICAL CHEMIST of ten years' practical FOUNDRY and ANALYTICAL experience desires a position with a large manufacturing concern where such foundry and laboratory experience would be appreciated. Address HYDRAULIC BRONZE, care THE METAL INDUSTRY.

SITUATION WANTED—CHEMIST, 8 years with U. S. GOVERNMENT. Thoroughly experienced in the analysis of non-ferrous alloys, metallurgical products. Desire to make a change and would like to correspond with an established concern. Can furnish excellent references. Moderate salary. Address J. J. B., care THE METAL INDUSTRY.

TRADE WANTS

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SITUATIONS WANTED—Continued

PROFESSIONAL—Cont'd

SITUATION WANTED—ELECTRICIAN, experienced at installing and maintenance of motors and generators, light and systems. Also experienced plater. Address W. V., care THE METAL INDUSTRY.

SITUATION WANTED—As CHEMIST. A technical graduate with five years' practical experience in metallurgical laboratories. Can furnish references upon request. Address N-4, care THE METAL INDUSTRY.

SITUATION WANTED—METALLURGICAL ENGINEER. Graduate of Columbia University, two years' practice. Best of references. Address N-5, care THE METAL INDUSTRY.

SALESMAN

SITUATION WANTED—SALESMAN especially successful in creating a demand for and marketing specialties and new goods, wants to represent manufacturer in Chicago and Middle West. Have well equipped office, capital; acquaintanceship with hardware, stationery and department store buyers, and can furnish best of references. Address SAVAGE, 52 Dearborn street, Chicago, Ill.

SITUATION WANTED—By a German with ten years' experience as office salesman in Germany in the BRASS and COPPER business. Willing to start with moderate salary. Address GERMAN, care THE METAL INDUSTRY.

TUBE MAKER

SITUATION WANTED—By SEAMLESS TUBE expert thoroughly understarding the manufacture of seamless tubes. Concern making small sizes preferred. Address F-5, care THE METAL INDUSTRY.

PATTERN MAKER

SITUATION WANTED—By a MODELLER and PATTERN MAKER in the Brass trade. Have had 25 years' experience in gas, electric, water and steam fittings, cabinet, brass foundry and bedstead manufacture. For four successive years have held a position as teacher in classes arranged for BRASS WORKERS in all departments, for practical and theoretical instruction. For full particulars of my ability, etc., address F-10, care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN METAL PATTERN MAKER experienced on steam specialties and plumbers' brass goods, also the manufacture of general brass goods. Address B, care THE METAL INDUSTRY.

TOOL MAKER

SITUATION WANTED—TOOL ROOM FOREMAN, with thorough mechanical experience in brass shop, wishes to change March 1st. Past 5 years with factory employing 600. Address F-8, care THE METAL INDUSTRY.

FOUNDERS

SITUATION WANTED—BRASS FOUNDRY SUPERINTENDENT or FOREMAN thoroughly experienced on ALUMINUM and BRASS CASTINGS, understanding mixing metal and molding machines, being a floor and bench molder. Can handle coal, coke, gas or oil furnaces. Can furnish best of references. Address F-4, care THE METAL INDUSTRY.

SITUATION WANTED—As FOREMAN in BRASS FOUNDRY. Capable of producing high-grade castings. Address A. B., care THE METAL INDUSTRY.

SITUATION WANTED—By a PLASTER COMPOSITION FOUNDRYMAN with 9 years' experience at fine arts castings in metals, plaster, wax and glue; also for patterns for engraving machines. Address P. C. F., care THE METAL INDUSTRY.

SITUATION WANTED—FRENCH SAND MOLDER wishes a position in foundry. Experienced on ornamental and architectural bronze, statuary, gold and silver castings. Estimates given on all kinds of work. Address FRENCH SAND MOLDER, care THE METAL INDUSTRY.

SITUATION WANTED—By a first-class BRASS FOUNDRY FOREMAN, American, 40 years old, 22 years' experience, 15 years as foreman. Capable of handling large foundry, both light and heavy work. Steady and reliable. Address G. L. A., care THE METAL INDUSTRY.

SHEET METAL WORKER

SITUATION WANTED—By FOREMAN SHEET METAL WORKER. Good all round man on brazing, silver soldering, hammering. Does own turning. Address F-1, care THE METAL INDUSTRY.

CHASER

SITUATION WANTED—By CHASER for ornamental and statuary work; 4 years' experience at Paris. Address F. C., care THE METAL INDUSTRY.

PLATERS AND POLISHERS

SITUATION WANTED—By FOREMAN PLATER, up to date in all branches desires a position with a good firm located in New York or vicinity. Eighteen years' experience on JEWELRY, BUCKLES and NOVELTIES. Will accept no salary if not satisfactory. Best of reference. Address F-6, care THE METAL INDUSTRY.

SITUATIONS WANTED—Continued

PLATERS AND POLISHERS—Cont'd

ELECTROPLATERS

Any one desiring the services of first class men for the electrodeposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the National Electro-Platers' Association, George B. Hogaboom, 656 Hunterdon Street, Newark, N. J.

SITUATION WANTED—FOREMAN PLATER and POLISHER or SUPERINTENDENT, executive ability, would like a position with a reliable firm. Can handle help to good advantage. Wages moderate. Address EXPERT PLATER, 45 LAWRENCE STREET, SOMERVILLE, MASS.

SITUATION WANTED—By FOREMAN PLATER who is thoroughly familiar with Copper, Brass, Nickel, Silver and Gold plating. Also thoroughly familiar with oxidizing of all kinds. Jewel boxes, trays, clocks a specialty. For further particulars and references, address F-2, care THE METAL INDUSTRY.

SITUATION WANTED—By a competent FOREMAN POLISHER with seventeen years' experience on all kinds of work. Can be depended upon to produce satisfactory results in the management of men and work. Can furnish the best of reference. If contemplating installing a polishing plant, write me. For further particulars address F-3, care THE METAL INDUSTRY.

SITUATION WANTED—By an experienced PLATER who desires a steady position. Capable of taking charge of POLISHING and BUFFING DEPARTMENTS. Position in Greater New York preferred. Address S. S., care THE METAL INDUSTRY.

SITUATION WANTED—As FOREMAN PLATER. Capable of handling all kinds of work. NOVELTY WORK A SPECIALTY. Several years' experience and can furnish the best of reference. Address F-7, care THE METAL INDUSTRY.

SITUATION WANTED—By a plater who has had charge of some of the largest plating plants in the world. Thoroughly familiar with all solutions and finishes, also plating on non-conducting surfaces, such as glass, lace, wood, plaster, etc. Address H. KEPPLER, 39 Sutton street, Brooklyn, N. Y.

SITUATION WANTED—A FIRST-CLASS PLATER who desires a position as foreman. Has had 22 years' experience in polishing, plating and buffing. Address BOX 188, care THE METAL INDUSTRY.

SITUATION WANTED—As FOREMAN or ASSISTANT FOREMAN PLATER. Auto lamps a specialty. Thoroughly familiar with plating in all its branches. Will accept position in New York City or out of town. Address GEORGE, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN-PLATER who thoroughly understands the plating business from A to Z. Has had several years' experience and is capable of taking charge. Address P. H., care THE METAL INDUSTRY.

SITUATION WANTED—POLISHER and PLATER wishes to change. Can furnish best of reference. Experienced on Chandeliers, Portables, Silverware, Casket Hardware and Builders' Hardware. No place too large. Address 0-5, care THE METAL INDUSTRY.

SITUATION WANTED—By a first-class ELECTRO PLATER with 20 years' experience on all classes of work, 14 years as foreman plater for large concerns. Expert on all solutions, dips and finishes. Can get any finish on novelties, silverware and hardware. Can furnish best of references and would like to hear from first-class firms. Address EXPERT, care THE METAL INDUSTRY.

SITUATION WANTED—By an ELECTRO-PLATER, 18 years' experience with Nickel, Copper, Brass and Bronze solutions and oxidizing. Can furnish good reference. Address BOX M-9, care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN POLISHER and BUFFER with 20 years' experience, 15 as foreman, thoroughly up to date in the hardware and other lines. Address R. J. J., care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER who is up to date on all finishes and colors. Desires a position with a good firm. Salary $30 per week. Address D-1, care THE METAL INDUSTRY.

SITUATION WANTED—By a GILDER EXPERT on shades of GOLD COLORING. Age 35. Position in Newark or New York City preferred. Address JEWELRY, care THE METAL INDUSTRY.

SITUATION WANTED—By FOREMAN of POLISHER, LACQUERER and BUFFER. Have had charge of 30 men for five years on bedstead trimmings. Also had charge of buffing room in a lamp factory and a chandelier factory. For further particulars of my experience, address L. J. A., care THE METAL INDUSTRY.

SITUATION WANTED—PLATER and ELECTRO-CHEMIST with a wide experience in the plating and coloring of art goods, jewelry and novelties. Address V. W., care THE METAL INDUSTRY.

SITUATION WANTED—By EXPERT PLATER familiar with all up-to-date colors. Novelty plating a specialty. Address, N-8, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER. First-class man on nickel, brass, copper, silver, black nickel; understands all hardware finishes, etc. Address N-2, care THE METAL INDUSTRY.

A PARTIAL LIST OF THE PRINCIPAL ARTICLES PUBLISHED IN THE METAL INDUSTRY DURING 1910.
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Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Company, New York.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Cabbaging Presses:
Famous Mfg. Co., East Chicago, Ind.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury Farrel Fdy. & Machine Co., Waterbury, Conn.

Cadmium.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Richards & Co., Boston, Mass.

Castings. (See also name of metal wanted).

Castings, Die
Finished Parts Mfg. Co., Newark, N. J.

Castings, Iron Machinery
Bliss Co., E. W., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Chemicals (See Platers' Supplies).

Chemists and Assayers.
Bayless Chemical Laboratory, Muncie, Ind.
Davenport & Keeler, New Britain, Conn.
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.
McKesson & Robbins, New York.
Renziehausen, Wm. F., Newark, N. J.

Chemists, Manufacturing
Ames, M., Glens Falls, N. Y.
Dow Chemical Mfg. Co., Mansfield, O.
Grasselli Chemical Co., Cleveland, O.
International Chemical Co., Camden, N. J.
Klipstein, A., & Co., New York.
McKesson & Robbins, New York.
Niagara Alkali Co., Niagara Falls, N. Y.
Roessler & Hasslacher Chemical Co., New York.
Swan & Finch Co., New York.

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Chromium Bronze.
Naulty Smelting & Refining Co., Philadelphia, Pa.

Chucks, Spinning
Bliss, E. W., Co., Brooklyn, N. Y.
Prylbil, P., New York.
Schulz, Fritz A., Chicago, Ill.

Cock Grinder, Automatic
Turner Machine Co., Philadelphia, Pa.

Composition Metal Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Eastern Metal & Refining Co., Boston, Mass.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
White & Bro., Inc., Philadelphia, Pa.

Composition Metal Tacks, Nails, Etc.
Hussey, C. G., & Co., Pittsburg, Pa.

Conveyors.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.

Copper Castings.
American Manganese Bronze Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.

Copper Ingots.
American Metal Co., New York.
American Smelting & Refining Co., Cincinnati, O
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Brothers, New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Taunton-New B'fd Copper Co., New Bedford, Mass
Vogelstein, L., & Co., New York.
White & Bro., Inc., Philadelphia, Pa.

Copper Nails and Tacks.
Hassall, John, Inc., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Scovill Manufacturing Co., Waterbury, Conn.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Copper Rivets.
Hassall, John, Inc., New York.
Hendricks Bros., New York.

Copper Sheets, Wire, Rods, Bolts, Etc. (See Brass and Copper Sheets, etc.).

Copper, Shot
Seymour Manufacturing Co., Seymour, Conn.

Copper Tubes (See Brass and Copper Tubes).

Core Compound (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.

Core Machines (See also Foundry Supplies).
Brown Specialty M'ch'y Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.

Core Ovens (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Gehnrich, Hermann, New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.
Rockwell Furnace Co., New York.
Smith, J. D., Foundry & Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Core Tapering Machines (See also Foundry Supplies).
Brown Specialty M'ch'y Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.

Cranes.
Detroit Foundry Supply Co., Detroit, Mich.

Crucibles, Platinum
Bishop, J., & Co., Malvern, Pa.

Crucibles, Stirrers, Stoppers, Nozzles, Etc. (See also Foundry Supplies).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Paige Retort & Crucible Co., Taunton, Mass.
Ross-Tacony Crucible Co., Philadelphia, Pa.
Taylor, R. J., Inc., Philadelphia, Pa.

Crushers, Cinder (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Farrel Foundry & Machine Co., Ansonia, Conn.
Moussette, O. J., Co., Brooklyn, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Cupror Metal.
Cupror Co., The, New York.

Cyanide of Potassium (See also Platers' Supplies).
Dow Chemical Mfg. Co., Mansfield, O.
McKesson & Robbins, New York.

Die-Castings.
Finished Parts Mfg. Co., Newark, N. J.

Dies, Sheet Metal Working
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Draw Benches—Wire, Rod and Tube
Farrel Foundry & Machine Co., Ansonia, Conn.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co

Drying-Out Machines.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Drosses (See Metal Turnings, Drosses, etc.).

Dust Collectors.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., The, Jackson, Mich.
Leiman Bros., New York.
Pangborn, Thomas W., Company, New York.

Dynamos, Platers' and Galvanizers' (See also Platers' Supplies).
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, C. L., & Sons, Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Electrical Resistance Materials.
Electrical Alloy Co., Morristown, N. J.

Electroplating, Coloring, Dipping, Etc.
American Toy & Novelty Co., Chicago, Ill.
Northern Ohio Mfg. & Refg. Works, Cleveland, O.

Emery. (See also Platers' Supplies).

Enameling Ovens.
Gehnrich, Hermann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Engineers, Mechanical, Foundry, Etc.
Pangborn, Thomas W., Company, New York.
Thompson, Hugh L., Waterbury, Conn.

Escutcheon Pins, All Metals
Hassall, John, New York.

Etched Name Plates.
Krizan & Hill, New York.
Schweizer, Max, Bridgeport, Conn.

Exhaust Fans.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Leiman Bros., New York.
Pangborn, Thomas W., Company, New York.

Expert Instruction—Plating, Coloring, Dipping Etching, Etc.
Proctor & Stremel, Arlington, N. J.
Schweizer, Max, Bridgeport, Conn.

Fire Brick (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.

Flasks, Brass Molders' (See also Foundry Supplies).
Diamond Clamp & Flask Co., Richmond, Ind.
Middleditch, Benj., Detroit, Mich.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.

Fluxes, Metal (See also Foundry Supplies).
Bassite Smelting & Mfg. Co., Cincinnati, O.
Cleveland Tensilite Co., Cleveland, O.

Fluxes, Soldering
Grasselli Chemical Co., Cleveland, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Spice, The Alfred, Process, Philadelphia, Pa.

Forgings, Automobile
American Manganese Bronze Co., New York.
Bliss, E. W., Co., Brooklyn, N. Y.

Foundry Facings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Dixon, Jos., Crucible Co., Jersey City, N. J.
McKesson & Robbins, New York.
Obermayer Co., The S., Cincinnati, O.
Stevens, Frederic B., Detroit, Mich.

Foundry Supplies and Equipment.
Birkenstein, S., & Sons, Chicago, Ill.
Brown Specialty Machinery Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Diamond Clamp & Flask Co., Richmond, Ind.
Middleditch, Benj., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Obermayer Co., The S., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Company, New York.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Furnace Linings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Rockwell Furnace Co., New York.
Stevens, Frederic B., Detroit, Mich.

Furnaces, Annealing, Brazing, Etc.
Bates & Peard Annealing Furnace Co., New York.
Detroit Foundry Supply Co., Detroit, Mich.
Leiman Bros., New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Furnaces, Electric
Bristol Co., The, Waterbury, Conn.

Furnaces, Galvanizing and Tinning
Farrel Foundry & Machine Co., Ansonia, Conn.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Melting, for Oil, Coal, Coke, or Gas. (See also Foundry Supplies).
Chicago Flexible Shaft Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Ideal Furnace Co., Chester, Pa.
Leiman Bros., New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Obermayer Co., The S., Cincinnati, O.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Wise, J. B., Watertown, N. Y.

Furnaces, Reverberatory
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Fusel Oil, Refined (See also Platers' Supplies).
Nikolas, G. J., & Co., Chicago, Ill.

Gas Engines.
Otto Gas Engine Works, The, Philadelphia, Pa.

Gas Producers.
Otto Gas Engine Works, The, Philadelphia, Pa.

Galvanized Specialties, Nails, Screws, Etc.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizers' Equipment (See also Platers' and Polishers' Supplies).
Dow Chemical Mfg. Co., Mansfield, O.
Globe Machinen & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Meaker Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Barrels and Automatic Devices.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Globe Machine & Stamping Co., Cleveland, O.

Galvanizing for the Trade.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Plants.
Globe Machine & Stamping Co., Cleveland, O.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Hanson & Van Winkle Co., Newark, N. J.

German Silver Ingots, Castings, Etc.
Electrical Alloy Co., Morristown, N. J.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.

German Silver Sheets, Wire, Rods, Tubes, Etc.
Electrical Alloy Co., Morristown, N. J.
Pilling Bros. Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.

Gold Alloys.
Riverside Metal Co., Riverside, N. J.

Gold, Chloride of (See also Platers' Supplies).
Ames, M., Glens Falls, N. Y.

Gold Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Graphite (See Foundry Supplies).

Grinding Wheels (See also Foundry Supplies).

Grinding Machinery.
Bennett-O'Connell Co., Chicago, Ill.
Blake & Johnson Co., Waterbury, Conn.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Dow Chemical Mfg. Co., Mansfield, O.
Osborn Mfg. Co., Cleveland, O.
Schulz, Fritz A., Chicago, Ill.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Heat Gages.
Bristol Co., Waterbury, Conn.

Hoists, Electric, Pneumatic, Hand
Detroit Foundry Supply Co., Detroit, Mich.

Hydraulic Machinery, Jacks, Etc.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

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Iron, Scrap, Dealers in
Smith, The, Morton B., New York.

Iron Tubes, Brass and Bronze Covered
Phoenix Tube Co., Brooklyn, N. Y.

Japanning Ovens.
Gehnrich, Hermann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Jewelers' Equipment and Supplies (See also Plater's Supplies).
Leiman Bros., New York.

Jewelers' Findings.
Smith & Richardson, Attleboro, Mass.

Kettles, Galvanizing and Tinning (See also Platers' Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.

Lacquer Enamels (See also Platers' Supplies).
Celluloid Zapon Co., New York.
Eureka Pneumatic Spray Co., New York.

Lacquering Ovens.
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Lacquer Sprayers.
Eclipse Air Brush & Compressor Co., Bloomfield, N.J.
Eureka Pneumatic Spray Co., New York.
Lederer Co., F. J., Buffalo, N. Y.
Passche Air Brush Co., Chicago, Ill.

Lacquers, Metal (See also Platers' Supplies).
American Lacquer Co., Bridgeport, Conn.
Celluloid Zapon Co., New York.
Egyptian Lacquer Manufacturing Co., New York.
Eureka Pneumatic Spray Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.
New Era Lustre Co., New Haven, Conn.
Nikolas, G. J., & Co., Chicago, Ill.

Ladle Heaters and Dryers (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Ladles (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.

Lathes, Polishing (See Platers' and Polishers' Supplies).

Lathes, Spinning, Turning, Etc.
American Tool & Machine Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn.
Pryibil, P., New York.
Schulz, Fritz A., Chicago, Ill.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Lathes, Turret
American Tool & Machine Co., Boston, Mass.

Lead, Antimonial
Leavitt, C. W., & Co., New York.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead Castings, Antimonial
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead, Pig and Bar
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.
Vogelstein, L., & Co., New York.

Lubricants.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Lycopodium. (See also Foundry Supplies).
McKesson & Robbins, New York.

Mahogany Pattern Lumber.
Thompson & Co., Lewis, Philadelphia, Pa.

Manganese Bronze Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Clum & Atkinson, Rochester, N. Y.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Manganese Bronze Sheets, Rods, Etc.
American Manganese Bronze Co., New York.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Manganese Copper.
American Metal Co., New York.
American Smelting & Refining Co., Cincinnati, O.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Manganese Metal.
Leavitt, C. W., & Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.

Manganese Silicon.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.

Magnesium Aluminum.
Leavitt, C. W., & Co., New York.

Magnesium Metal.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Roessler & Hasslacher Chemical Co., New York.

Magnetic Metal Separators (See also Foundry Supplies).
American Concentrator Co., Joplin, Mo.
Capitol Brass Works, Detroit, Mich.
Dings Electro-Mag. Separator Co., Milwaukee, Wis.
Pangborn, Thomas W., Company, New York.

Match Plates.
Goodale Co., The, Kalamazoo, Mich.
Middleditch, Benj., Detroit, Mich.

Metals (See name of metal wanted).

Metal Cleaning Compounds (See also Platers' Supplies).
Anthony, H. M., & Co., New York.
Cleveland Platers' Supply Co., Cleveland, O.
Dow Chemical Mfg. Co., Mansfield, O.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Camden, N. J.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.

Metal Fluxes (See also Foundry Supplies).
Bassite Smelting & Mfg. Co., Cincinnati, O.
Cleveland Tensilite Co., Cleveland, O.
Reeves, Paul S., & Son, Philadelphia, Pa.

Metallurgists, Consulting.
Bayless Chemical Laboratory, Muncie, Ind.
Davenport & Keeler, New Britain, Conn.
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.

Metals, Dealers in all Kinds of New (See also name of metal wanted).
Andler, M. M., & Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Moers, Albert A., New York.
Richards & Co., Boston, Mass.

Metals, Dealers in Old
Andler, M. M. & Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Eagle Smelting & Refining Works, New York.
Genesee Metal Co., Rochester, N. Y.
Hofeller, Theodore, & Co., Buffalo, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B., Co., New York.
Riverside Metal Co., Riverside, N. J.

Metals, Dealers in Old—Gold, Silver, Platinum
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Goods Made to Order.
Aluminum Goods Mfg. Co., Newark, N. J.
American Toy Novelty Co., Chicago, Ill.
Ansonia Brass & Copper Co., New York.
Bridgeport Brass Co., Bridgeport, Conn.
Krizan & Hill, New York.
Manhattan Brass Co., New York.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Waterbury Brass Co., Waterbury, Conn.

Metal, Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.
National Sheet Metal Co., Peru, Ill.

Metal Refiners, Gold and Silver.
Genesee Metal Co., Rochester, N. Y.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Refiners—White Metal.
Birkenstein, S., & Sons, Chicago, Ill.
Reeves, Paul S., & Sons, Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

Metal, Silver Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.

Metal Spinning. (See also Metal Goods made to order).
Detroit Metal Spinning Co., Detroit, Mich.
Riverside Metal Co., Riverside, N. J.

Metal Stamping. (See also Metal Goods made to order).
Detroit Metal Spinning Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Krizan & Hill, New York.
Riverside Metal Co., Riverside, N. J.

Metal Turnings, Drosses Residue, Etc., Buyers of
Andler, M. M., Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Eagle Smelting & Refining Works, New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.
Smith, The Morton B., Co., New York.
Toothill, John, Rochelle Park, N. J.

Mold Dryers, Portable (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Company, New York.
Rockwell Furnace Co., New York.

Mold Spraying Machines. (See also Foundry Supplies).
Pangborn, Thomas W., Company, New York.

Molds, Ingot (See also Foundry Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.
Leiman Bros., New York.
Nicholls, Wm. H., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Molding Machines. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Turner Machine Co., Philadelphia, Pa.

Monel Metal, Sheets.
Merchant & Evans Co., Philadelphia, Pa.

Muntz's Metal—Sheets, Rods, Bolts, Nails, Etc.
Taunton-New B'f'd Copper Co., New Bedford, Mass.

Nails. (See name of metal wanted).

Name Plates, Etched
Krizan & Hill, New York.

Nickel Alloy, Special
Lamport, H. W., & Co., Chicago, Ill.

Nickel.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Nickel Castings.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.

Nickel Salts. (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Dow Chemical Mfg. Co., Mansfield, O.
Hanson & Van Winkle Co., Newark, N. J.
McKesson & Robbins, New York.

Nickel, Shot
Merchant & Evans Co., Philadelphia, Pa.
Seymour Manufacturing Co., Seymour, Conn.

Nickel Silver Tubes.
Wells, A. H., & Co., Waterbury, Conn.

Oil Pumps and Storage Tanks.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Oils, Tempering and Lubricating
McKesson & Robbins, New York.
Swan & Finch, New York.

Ovens. (See also Core, Lacquering, Enameling and Sherardizing Ovens).
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Paint for Metals, Etc.
Woolsey, C. A., Co., Jersey City, N. J.

Parting Compounds. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.

Pattern Lumber, Mahogany
Thompson & Co., Lewis, Philadelphia, Pa.

Pattern Shop Supplies and Equipment.
Diamond Clamp & Flask Co., Richmond, Ind.

Pewter.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Phosphor Bronze Ingots, Castings, Etc.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
Clum & Atkinson, Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Bronze Sheets, Wire, Rods, Etc.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Copper.
American Smelting & Refining Co., Cincinnati, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
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